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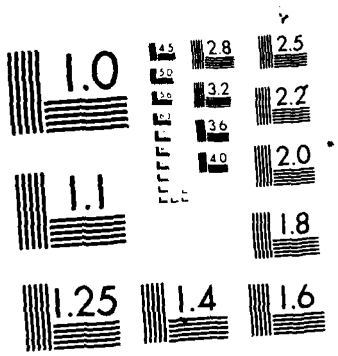

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AD-A173 865

ARCHAEOLOGICAL INVESTIGATIONS AT

TARAGUE BEACH,

GUAM

by

J. Stephen Athens

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report submitted to:

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Cultural Resources Investigation of Tarague Beach, Guam

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ABSTRACT

Under contract to the U. S. Air Force, archaeological investigations were carried out by the author at Tarague Beach on Andersen Air Force Base, Guam. Fieldwork included the excavation of 5 test units at two locations and the preparation of a long trench profile. In addition, extensive background literature and documents research was undertaken. This research disclosed serious deficiencies in the data used to support the inference advanced by Kurashina and others that Tarague Beach was initially occupied by 1500 B.C. Until further radiocarbon dating and field investigations can be undertaken, a definite initial occupation date cannot be reliably advanced. However, it is clear that the earliest archaeological deposits cannot date prior to about 1,000 B.C. and that they could date somewhat less than that. Information on the earliest securely dated sites in Guam and the other Mariana Islands is briefly presented. In addition, the context of Mariana Islands prehistory in Micronesia is discussed.

The background research also included a detailed examination of the Mariana Island pottery sequence. Much of this information is from Moore's (1983) study of latte and pre-latte materials excavated under the direction of Kurashina at Tarague. Despite a major problem of small sample size for the pre-latte sherds and insufficient radiocarbon dating of the latte layer, the systematic and detailed nature of the study provide a solid basis for seriation studies.

Three excavation units of the present project disclosed pre-latte deposits below a burial that had been disturbed by recent road grading. Immediately outside the graded area in another excavation unit there were dense latte period deposits stratigraphically above the pre-latte materials. A radiocarbon date of A.D. 1420-1650 was obtained from the latte layer. The pre-latte deposits may date from 0 to 500 A.D. as suggestesd by attribute analysis. Infiltration of a small number of sherds from upper layers to lower layers by natural processes was indicated by distributional and density analyses.

Profiling of the burn pit trench at the extreme eastern end of Tarague revealed three occupation layers. Excavation of a test pit next to the profile provided documentation of artifact contents of these layers, as well as 3 radiocarbon dates. Two dates are from the middle and upper layers, and one date is from a lower non-occupation (but possibly cultural) layer. The dates, from top to bottom, are A.D. 1400-1515, 1260-1405, and 625-895. All pottery pertained to the latte period, and there was no evidence for a pre-latte occupation.

Extensive analyses were undertaken of the pottery, midden remains, skeletal remains, and non-ceramic artifacts. Various problems and interpretive difficulties are noted in the discussion.

It is recommended that due to the extremely significant nature of the archaeological remains at Tarague, the Air Force should take every precaution to insure that there is no land disturbance without prior clearance by a qualified archaeologist. It is also suggested that a cultural resources management plan be prepared, that the burn pit be filled in, that road grading be confined to the present road bed with no deepening of the bed, and that a nomination form for the National Register of Historic Places be submitted for the Tarague Beach area.

ACKNOWLEDGEMENTS

The author is grateful to the many persons who have assisted in the investigations at Tarague. Many of these people and their roles in the research are mentioned in the Introduction. The author would also like to extend his gratitude to Mr. Vern Toby, Lt. Menkhis, and Mr. Eduardo Garcia of the Base Civil Engineering Environmental Section at Andersen Air Force Base for facilitating the fieldwork and providing information and helpful advice during the course of the investigations. In addition, the author would like to thank the staff at the Micronesian Area Research Center of the University of Guam, and the staff at the Bishop Museum library in Honolulu for their help with research materials. Finally, for their hospitality, helpful advice, and many favors during during the period of fieldwork on Guam, special thanks must be given to Rosalind Hunter-Anderson and Yigal Zan.

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CHAPTER 1

INTRODUCTION AND GENERAL BACKGROUND RESEARCH

Project Introduction

This report concerns archaeological investigations conducted at Tarague Beach on the north coast of Guam, Mariana Islands (see map, Fig. 1). The site location is within Andersen Air Force Base, which occupies much of the northern part of Guam. Prior to the present investigations, archaeological research by Kurashina (Kurashina and Clayshulte 1983a, 1983b; Kurashina et al. 1981) and Ray (1980) clearly established the importance of the area to the island's prehistory. In addition, several previous investigators had also noted the presence of archaeological remains at Tarague Beach. The Guam Territorial Archaeological Laboratory lists all archaeological remains within the Tarague area as Site No. 66-07-0015. Although a nomination form to the National Register of Historic Places was filled out for the Tarague Beach Archaeological District, it was never submitted.

The impetus for the present project came as a result of the accidental discovery of human remains during the grading of a dirt road near the Rifle Range at Tarague Beach by Andersen personnel (see map, Fig. 1). Apparently only the remains of a single individual were disturbed, which was indicated in the project's scope of work and later corroborated by Mr. Richard Davis, Territorial Archaeologist for Guam. This disturbance resulted in the need to retain a professional archaeologist to remove the remains, as well as to assess the significance of the area that had already been disturbed and adjacent areas that might be disturbed by future maintenance and road work activities. It was furthermore decided that a nearby trench, used as a burn pit by E.O.D. (Explosives and Ordnance Disposal) personnel at Andersen A.F.B., should be evaluated for possible cultural remains. Field investigations, therefore, were confined to these two areas on the eastern side of Tarague Beach, which are separated by a distance of approximately 1.5 kilometers (0.93 miles or 1,651 yards; see map, Fig. 1).

Besides the above field investigations, the project's scope of work called for the preparation of an archaeological map showing all recorded or known cultural resources within the area. Instructions were also given for appropriate documentation of all field investigations, use of standard laboratory identification and analytical procedures for processing recovered archaeological remains, submittal of radiocarabon dates, and the preparation of a report. Additional details regarding the specific requirements of the scope of work with respect to the various aspects of the required investigations will be noted in the appropriate sections of this report.

The author served as Principal Investigator for the project. Fieldwork was carried out on Guam between February 17th and March

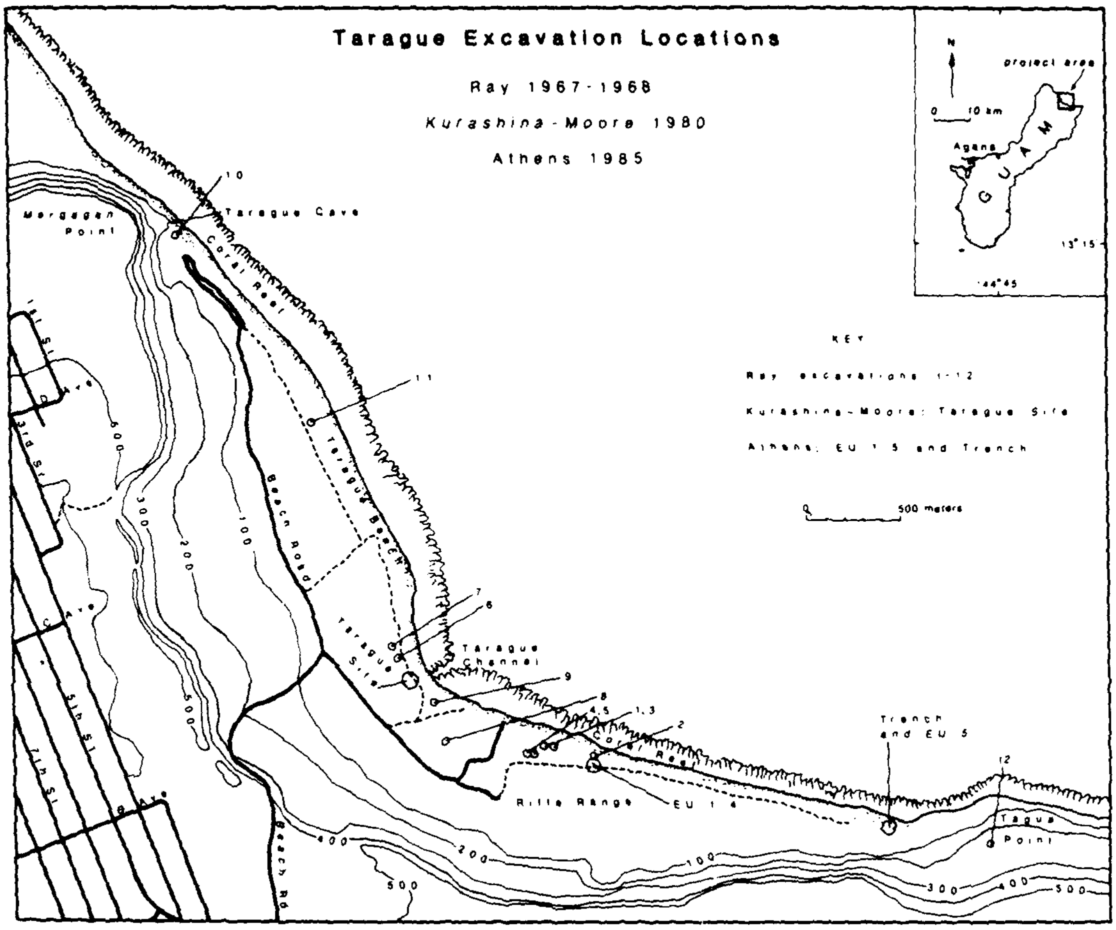


Figure 1. Map of Tarague Beach showing locations of archaeological excavations by Athens (present project), Kurashina and Moore (1980), and Ray (1967-1968).

17th, 1985. Approximately 1 week of this four week period was spent conducting background research in the library at the Micronesian Area Researach Center of the University of Guam, and also visiting with local researchers and institutions involved in historic preservation activities on Guam. The latter included Dr. Michael Graves, archaeologist at the University of Guam (now Director of M.A.R.C.), Ms. Darlene Moore, research associate in archaeology, University of Guam, Dr. Rosalind Hunter-Anderson, visiting research associate at M.A.R.C. (now at W.E.R.I.), Dr. Russell Clayshulte, marine geologist at the University of Guam Water and Energy Research Institute (W.E.R.I.), Mr. Richard Davis, Guam Territorial Archaeologist at the Historic Preservation Section, Dept. of Parks and Recreation, Government of Guam, Mr. John Salas and Mr. Vittorio April, archaeologists at the Guam Territorial Archaeology Laboratory, Historic Preservation Section, Dept. of Parks and Recreation, Government of Guam, and Mr. Tony Pangalinan, independent archaeologist. In addition, the simultaneous fieldwork conducted at Agana Swamp by Dr. Ross Cordy with Mr. Kanalei Shun and Ms. Jane Allen, all of Hawaii and working under a Corps of Engineers contract awarded to Dr. Athens, provided for a stimulating exchange of information and references concerning Guam's prehistory. Finally, the presence in Guam of Corps of Engineers' archaeologist, Mr. Charles Streck from Hawaii, who was monitoring investigations for both the Tarague Beach and Agana Swamp projects, provided a further resource for information and advice.

Fieldwork, once initiated, did not continue uninterrupted during the course of the project. This was because use of the Rifle Range next to the site area, which had been scheduled well in advance by Andersen personnel, prevented access to Tarague Beach as a safety precaution. Fortunately, however, the month of March was only lightly scheduled and interruptions were few. As a result, though, work was typically conducted over weekends and for long hours in order to finish the scope of work within the alloted time. A total of 14 days were actually spent in the field at Tarague Beach. In addition, inspection trips were made to Kurashina's excavation units at Tarague Beach, the Hila'an latte site (northcentral western coast of Guam), the Tapony site (a large inland latte site in southern Guam), and the Nomna Bay latte site (southeast coast of Guam).

Because of a shortage of trained archaeologists on Guam, it was not possible to employ a single field assistant for the duration of the project. Intermittant professional assistance, however, was provided by the following individuals: Charles Streck (5 days), Kanalei Shun (4 days), John Salas (1 day), Tony Pangalinan (1 day). The author worked alone on 6 days.

Midden sorting and marine shell identification were performed by Ms. Patricia Spears in Hawaii. Special forms,

designed by Mr. Charles Streck for analysis of Micronesian shell midden remains, were utilized by Ms. Spears. The author performed all artifact analyses. Field descriptions of soils were made with the assistance of Mr. Charles Streck. Ms. Jane Allen also provided comments on soils during an afternoon visit to the site. Bone identifications were undertaken by Ms. Sara Collins, and osteological analysis of human skeletal remains was carried out by Dr. Michael Pietrusewsky.

Upon completion of archaeological investigations, all archaeological samples, artifacts, and appropriate documentation (field notes, field catalog, etc.) will be curated at the Guam Museum of the Nieves M. Flores Memorial Library in Agana, Guam.

The organization of this report will be to first, in Chapter 1, provide a general introduction to the study of prehistory on Guam, including discussions on Guam's environment, the archaeology of Guam, traditional Chamorro subsistence and settlement, Chamorro society in Micronesia, and research goals. This will be followed by Chapter 2, which specifically focuses on the Tarague area. This will include sections on Tarague's environment, historical context, and previous archaeological investigations. The intention here will be to define in as great of detail as possible the nature and extent of known historic and prehistoric archaeological remains at Tarague. This will be followed by Chapter 3, which will be an account of the present field investigations, including methodology, discussion of excavation units, soils and stratigraphy, and a listing of materials recovered during excavations. Chapter 4 will present the analyses of pottery, non-ceramic artifacts, shell midden, fish and mammal bone, human skeletal remains, and site chronology. Chapter 5 will summarize research findings, interpretations, and limitations of the data, and Chapter 6 will present recommendations for site management and historic preservation.

Environment

The island of Guam has an area of 209 sq. miles, measuring 30 miles in length (north-south) and 4 to 8 miles in width (east-west). Although it is the largest island in Micronesia, it is, by comparison, only about one-third the size of the island of Oahu in Hawaii (608 sq. miles). Situated in the far western Pacific at a latitude of 13 degrees north, the island is at the southern end of the Marianas chain, which includes Rota, Tinian, Saipan, and other islands to the north. The Philippine Islands are located approximately 1500 nautical miles to the west, and Honolulu is 3,337 nautical miles to the east-northeast.

Geologically and physiographically Guam is divided into two sharply differentiated provinces. The northern half of the island is composed principally of a raised limestone plateau, formerly a coralline reef, sloping from 200 ft. near the island center to more than 600 ft. at the northern end (see Photos 1-3). The land surface of this plateau is gently undulating, though intrusive volcanism has formed several low hills (e.g. Mt. Santa Rosa). In many areas the plateau is bordered by a narrow and irregular coastal plain fringed by reefs. Because of the porosity of the limestone, little or no surface water is available on the plateau, though percolating rainwater has formed a large, continuously recharging freshwater lens below the surface and floating on the heavier saltwater. Deep wells presently tap this water, though prehistorically it would have been most accessible from springs, seeps, and limestone sink holes along the base of the plateau.

Present day vegetation in the north consists largely of dense tangan-tangan (Leucaena glauca), a leguminous shrub sown thrughout the Mariana Islands by the military after World War II. Former vegetation consisted of banyan (Ficus prolixa), wild breadfruit (Artocarpus mariannensis), and Mammea odorata for the upper story, and Ochrosia, Eleocarpus, Morinda citrifolia, Cycas circinalis, and other small trees, along with lianas and epiphytes for the understory.

In contrast with the northern half of the the island, the south half of Guam is very hilly and dissected by a number of stream valleys. This reflects an abrupt change in the geological makeup of the island. In the south the rocks are mostly volcanic in origin, being of early Tertiary age (central area) and Miocene age (south area). Faulting and folding have greatly deformed the rocks of the central area, while the south is much less deformed. The andesitic rocks of Guam are believed to have continental affinities. The highest point is Mount Lamlam, which is 405 meters (1,334 ft.). The mountains of the south, forming a north-south range with many peaks over 1,000 ft. in elevation, rise steeply from the west side of the island, and descend more gradually to the east. Because of the generally impermeable nature of the volcanic rocks, a subsurface freshwater lens cannot form as in the north. Freshwater is confined to surface discharge, with several perennial rivers and streams, and a large number of intermittent streams carrying most of the water.

As in the north, fringing reefs are found along much of the shoreline. At the extreme southern tip of Guam there is also a small barrier reef enclosing a lagoon (Cocos Barrier Reef), and another one (Luminao Barrier Reef) near the center of the island's west coast. There are also several small embayments located along the south part of the island.

Swordgrass (Miscanthus floridulus), along with the grass, Dimeria spp., comprise the predominant vegetation cover in the south, though there are numerous small forest clumps composed of coconut palms, cycad palms (Cycas circinalis), betelnut palms (Areca sp.), and other species. It is probable that the swordgrass community has expanded in size during the historic period due to intentional seasonal burning.

A more detailed discussion of Guam's geology and physiography may be found in Tracey et al. (1964) and Key (1968), and Moore (1983:6-19) provides an excellent overview of Guam's natural environment. The essential point to note here is that there are major environmental differences between the northern and southern halves of Guam. Geology, physiography, vegetation, soils, and freshwater availability all have quite distinctive characteristics in the two areas, and presumably this would have had an effect on prehistoric cultural adaptations.

With respect to climate, there are two main seasons on Guam. These are a wet season between the months of July and November, and a dry season from January to May. The intervening months are transitional. The wet season is notable not only for the rain, but for the typhoons that may occur, which are 5 times more common in the wet season than the dry season. Tracey et al. (1968:10) indicate that typhoons are moderately common on Guam, and that,

> chances are approximately 2 in 3 that one or more typhoons will pass within 120 nautical miles of Guam in any particular year. The chances are about 1 in 3 that in any year one or more typhoons will cause considerable damage. They bring high seas, destructive winds, and flooding rainfall, and are one of the principal agents of erosion and redistribution of sediments.

Clearly, such frequent storms would present certain adaptive problems to Guam's prehistoric inhabitants, especially given their destructive potential to tree crops and the settlement of low-lying areas.

Rainfall on Guam ranges on average from somewhat less than 90 inches to over 110 inches in the higher mountain areas. While highly irregular from year to year, about two-thirds of the total amount falls during the wet season. Average monthly rainfall during this period is between 12 to 15 inches per month, with rain falling on 20 to 25 days per month. In contrast, the dry season may have less than one inch of rainfall for any given

month. With the gusting trade winds of this period and generally clear skies, evaporation rates also tend to be high. Shortage of water, therefore, is common during the dry season, and even droughts may occur. The implications for agriculture are obvious.

Temperature on Guam averages 80.9°F, with only very slight variations from month to month. Daily highs rarely exceed 90°F, and daily lows rarely dip below 70°F.

Archaeological Investigations--Guam's Prehistory

This section will attempt to provide a very brief overview of the most salient aspects of present knowledge concerning Guam's prehistory. Further details may be pursued in the references provided in the discussion. At the outset, it should be noted that this review will be selective and at times critical. The intention is to bring into focus not only the broad outline of Guam's prehistory and the various aspects of the data base thought to be most essential for understanding social processes, but to point out problem areas in our understanding of it.

Initial Settlement: Archaeological Evidence

The earliest evidence for human settlement in the Mariana Islands is not without interpretive difficulties. A date of 1527 ± 200 B.C. from the Chalan Piao site on Saipan (Spoehr 1957:65-66, 168-178) is frequently cited as evidence for settlement in the second millennium B.C. (Shutler and Shutler 1975:91; Reinman 1977:89-90; Bellwood 1979a:22). However, both Bellwood (1979b:282-283) and Kurashina and Clayshulte (1983a:120; 1983b:12) note that there are problems with this particular date. It is derived from shell that is not definitely food refuse, its stratigraphic location is suspicious (it was recovered from a depth of 0.5 meters in a site with 2 meters of deposits), and recent redating of the same sample produced an age of only A.D. 220 ± 450. As Kurashina and Clayshulte (1983b:12) observe:

> No radiocarbon date is as yet available from other sites on Saipan, Tinian, or Rota which would indicate human settlement during the 2nd millenium [sic] B.C. or older.

With respect to Guam, two sites are potential candidates for a second millennium occupation. These are Nomna Bay and Tarague

Beach. However, there are also serious problems with a second millennium attribution to these sites. In the case of Nomna Bay, Reinman (1977:39) recovered a charcoal sample dating to 1890-1270 B.C. (all charcoal dates will be presented as calibrated dates according to Klein et al. 1982 unless otherwise indicated; the range represents a 95% confidence interval). The date from this sample, unfortunately, is not only inverted with respect to the stratigraphy, but it is inconsistent with the other 12 dates from the site.

Reinman (1977:39-41) believes the inversion is probably due to a mix-up in sample labels. He further believes that the considerable age of the early date--over 1,200 years older than the next oldest date--is reasonable in view of the fact that Stratum II (where the charcoal sample is believed to have come) is different from the soil in the other areas found beneath Stratum I. In effect, Reinman seems to be suggesting that the very early occupation at Nomna Bay is quite restricted in areal extent in that the associated sediment matrix was not observed in the other 17 excavation units at Nomna Bay.

In consideration of these ambiguities at Nomna Bay, about the only thing that can be said is that any inference for a very early occupation is extremely tenuous at best. Though not addressing the problem in such detail, Kurashina and Clayshulte (1983a:120; 1983b:12) reached a similar conclusion. It is hoped that an archaeologist will take the initiative in the near future to excavate several additional test pits at the Nomna Bay site and submit more samples for radiocarbon dating. In this way the dating problem could be resolved quite easily and forthrightly.

At Tarague Beach the dating problem derives from a series of radiocarbon samples processed from the South Profile excavation, which is over 3 meters deep and contains 8 distinct soil strata with cultural material. The field investigations were carried out under the direction of Kurashina with the results reported in Kurashina and Clayshulte (1983a, 1983b); Kurashina et al. (1981); and Moore (1983). Table 1 presents a summary of the radiocarbon dating information (from Moore 1983:65-66)

An additional date bearing on the South Profile chronology is that from Ray (1980:284). A charcoal sample from his Test Pit 7, which is very close to the South Profile (see map, Fig. 1), dated to 2000 ± 100 B.P., or B.C. 365 - A.D. 220 This is from his Stratum V, which Moore (1983:65) says likely correlates with Layer VI of the South Profile (a second date processed by Ray from his Stratum III is discussed in the following chapter).

Foremost among the difficulties of the chronology proposed by Kurashina and Clayshulte for a 3,500 year archaeological

Table 1. Radiocarbon dates reported from the South Profile, Tarague Beach.

Layer	Material	Date B.P.	C-13 Adjusted Date	Calibrated Date
I	charcoal	1150 ± 80	-	A.D. 630 - 1045
V	fish bone	2100 ± 270	-	B.C. 785- A.D. 425
VII	fish bone	3060 ± 350	-	B.C. 1905 - 780
VIII	shell*	3000 ± 80	B.C. 1485	-

*primarily limpets collected from -3.0 to -3.5 meters in the profile.

sequence at Tarague (dating from 1500 B.C.) is their use of a C-13 corrected date on shell for the Layer VIII sample. Experience has shown that C-13 correction on shell usually results in a radiocarbon age at least 300 to 500 years older than what the sample should be. This is because the ocean "reservoir effect" must be taken into consideration if an accurate age determination is to be made. As Browman (1981:274) has explained,

> In the sea, up-welling of deep water, containing large amounts of older dissolved carbon dioxide,...provides the growing organism with bicarbonate depleted or deficient in Carbon 14 with respect to the atmosphere.

Thus, shell samples may have a radiocarbon age older than their actual calendar age. The actual difference appears to be related to the amount of up-welling, with the presently documented range being from 800 years too old for the Oregon and Washington coasts (Robinson and Thompson 1981) to 336 years too old for New Zealand shells (Law n.d.).

In order to determine the possible correction factor for shell in Guam, a sample of modern shell was obtained from the Bishop Museum in Honolulu for radiocarbon dating. This sample consisted of 30.9 grams of Strombus gibberulus gibbosus, which had been collected by Eugene S. Kuhns in 1930 from Sumay in Guam.

The resulting radiocarbon date was 130 ± 50 B.P. With the C-13/C-12 adjustment, the date becomes 590 ± 50 B.P. Subtracting the date of collection from the standard 1950 radiocarbon reference date, the correction factor for this particular shell sample is 570 years.

Although a single sample is not sufficient to adequately determine the ocean reservoir correction factor for shell dates in Guam, the above sample certainly demonstrates that the magnitude of the correction may be quite significant for the derivation of accurate radiocarbon dates on archaeological shell specimens in Guam. In the case of the early 1485 B.C. date reported by Kurashina and others at Taraque, the Sumay sample suggests that the actual date is probably on the order of 915 B.C. (570 subtracted from 1485; the Klein et al. [1982] calibration should not be used on shell dates).

In the absence of a reliable correction factor, the standard practice among some archaeologists has been to use the non-C-13/C-12 corrected age of archaeological shell samples as an approximation of the true calendar age of their samples. While the date would still be subject to possible considerable inaccuracy, it is much better than letting the C-13 adjusted age stand as the true age. Clearly, this is what Kurashina and Clayshulte should have done, thereby providing an estimated date for the oldest Taraque cultural deposits at 1,050 B.C. (3000 B.P. - A.D. 1950). This, of course, is substantially different from the 1,485 B.C. date that Kurashina and Clayshulte give to their earliest archaeological deposits at Taraque.

Unfortunately, the problem with the Layer VIII Taraque sample does not end here. Two questions that must be answered are whether the dated shell is associated with the cultural material and whether the cultural material is properly associated with the Layer VIII sediments. There are reasons to believe that both of these questions have answers that make the assigned age of the archaeological materials very tentative at best.

The geological context of Layer VIII indicates deposition of sediments as a result of storm wave activity. According to Kurashina and Clayshulte (1983a:115-117),

> Dependent on the storm wave size and duration, a portion or all of the A soil horizon and sometimes part of the B horizon can be eroded. As the storm wave height decreases, the berm and backshore area is subjected to sediment deposition. <u>These sediments are derived from the reef flat and foreshore environment.</u> (Kurashina and Clayshulte 1983a:115-117; emphasis added).

Layer VIII, which is approximately 2.2 meters thick in the profile of Kurashina of Clayshulte (almost as thick as the rest of the cultural layers put together; however Moore [1983:63] lists the thickness as 30 to 76 cm--this is possibly only the portion containing archaeological deposits), is thus clearly the product of highly disturbed secondary deposition, which is so identified by Kurashina and Clayshulte (1983a:117, 1983b:8). There is no reason, therefore, to assume that the shells used for dating and derived from a half meter thickness of Layer VIII (Kurashina and Clayshulte 1983b:9), are themselves the product of cultural activity, or furthermore, that they are temporally associated with cultural materials found in the same depositional unit. Given the nature of the deposits, Kurashina and Clayshulte may have dated older natural shell that became mixed with a few pottery sherds and an adze. At this point, short of dating the actual cultural material, there is no way to be certain just how old the cultural occupation is given the redeposited nature of the Layer VIII sediments.

A related question is whether the cultural materials in Layer VIII are actually associated with the Layer VIII sediments. In this respect, Moore (1983:67) lists the total excavated volume of sediments from the South Profile (where Layer VIII was excavated) at 8.57 cubic meters. Within all excavated strata in the South Profile a total of 423 pottery sherds were recovered. This gives an concentration (density) index of 49.3 sherds per cubic meter for the entire excavation (unfortunately, volumes for each soil strata are not given), which is quite low. This compares to a density of 103 sherds per cubic meter for Excavation Units 1-3 of the present project, where the sediments have probably been entirely redeposited by storm waves. With respect to Layer VIII of the South Profile, the true density figure must be much lower as only 18 sherds were recovered from that unit, which is slightly more that half (34) of the sherds found in Layer VII. These are all presumably from the 30 to 76 cm thick upper part of Layer VIII that is illustrated by Moore (1983:64). On the other hand, if the sherds are distributed from throughout the 2.2 meter thick layer (as illustrated in Kurashina and Clayshulte 1983a and 1983b), then the density of the sherds would be much smaller still. The South Profile has a width of 2.8 meters.

What all of this suggests is that cultural material in Layer VIII may not be associated with the Layer VIII sediments at all (either as redeposited materials from storm wave activity or *in situ*). The sherds and adze may actually be derived from Layer VII or above, having infiltrated downward through the sediments by means of natural processes and bioturbation (crab burrowing, tree roots, etc.). There is no certainty, of course, that this is what happened. However, the available information suggests that this is a realistic possibility and should be considered.

This, of course, places additional doubt on the validity of the Layer VIII shell date for the cultural materials even if the radiocarbon dated shell is accepted as being of the same age as the rest of the sediments. In order to investigate this problem further, it would be of interest to have the depths of each of the pot sherds and the adze. Are they mostly near the upper boundary with Layer VIII, or are they scrambled throughout the Layer VIII deposits? The former situation would suggest a derivation from Layer VII or above. The latter would support the interpretation of Kurashina and Clayshulte for a storm wave event as being responsible for the redeposition of the pottery in Layer VIII.

With respect to the Layer VII date of 3,060 ± 350 B.P., the first thing that may be noted is that the date has such a large standard deviation as to make precise chronological inferences impossible. Indeed, the calendar corrected date, as previously noted, is 1,905 - 780 B.C. Thus, the date could easily be at the low end of its range (the high end is not a realistic possibility). That this may in fact be the case is suggested by the previously mentioned charcoal date obtained by Ray in his Test Pit 7. The provenience of this date (his Stratum V) is considered to correlate with Layer VI in the South Profile. Its age of B.C. 365 - A.D. 220 suggests that the Layer VII date may be much too early, as would be the case with the Layer V date.

The reason the Layer VII and Layer V dates may be too early could have something to do with the fact that both were obtained on fish bone. This is a dating medium of uncertain attributes. Since it is from a saltwater fish, it is not known whether the reservoir problem would affect the dating results in the same way it does shell. Being bone, furthermore, there is the problem of isotope discrimination. A C-13/C-12 ratio would have helped in evaluating this possible source of error, but such was not done.

This has been an obviously lengthy discussion of a very small aspect of the total amount of information concerning the archaeology of Guam. However, it is justified in that very serious problems concerning the date for the initial settlement of Guam and the other Mariana islands have not been generally recognized. Thus, the basic conclusion is that there is still no firm evidence for settlement on Guam or the other Mariana islands prior to the first millennium B.C. This is not to say that the islands were unoccupied before then; there is just no definite, believable data to say that they were.

Before too long it appears that this conclusion may have to be modified. Dr. Joyce Bath (personal communication) undertook an extensive archaeological data recovery project in the Tamuning area of Guam (just to the north of Agana) in late 1985. She reports a series of charcoal dates in association with pottery

from the second and third millennia B.C. The dates--all charcoal--are said to be from several sites, in good stratigraphic context, and securely associated with cultural material.

Other than the Tamuning data, which has not yet been reported upon, what is presently the earliest definite evidence for the initial occupation of Guam and the Mariana islands? This would be Laulau on Saipan, which has a long sequence that is said to have begun at around 1,000 B.C. (Marck 1980:21). Unfortunately, its excavator, Marck, never finished the report and details of the radiocarbon dating are not included in his manuscript. However, a recent proposal request from the Historic Preservation Office of the Commonwealth of the Northern Mariana Islands in Saipan (dated May 1986) lists two dates from this site: 2905 ± 100 B.P. and 2890 ± 100 B.P. The calibrated ages of these dates would be 1380 - 830 B.C. and 1375 - 825 B.C., respectively. It is assumed that they were were derived from charcoal. Additional research has recently been undertaken at this site, and further dates and documentation of the cultural material are expected.

The Muchon latte site on the island of Rota has produced dates of 2,460 ± 85 B.P. and 2,590 ± 85 B.P. on Layers VI and VIII, respectively (Takayama and Intoh 1976:21). The earlier date, derived from charcoal, has a calibrated range of 1,010-425 B.C. The Layer VI date, derived from turbo shells, has a non-calibrated date of 510 B.C. Later archaeological deposits were present in the upper layers.

For the island of Guam the earliest dates appear to be from a Fonte River site, which is located near the coast on the west side of the island. Shell dates of 430 ± 80 B.C. and 530 ± 100 B.C. (not calibrated) were obtained for Layers IV and V (Cordy and Allen 1986:193). The previously discussed Tarague Beach materials of Kurashina and Clayshulte (1983a, 1983b) are presumably at least this old, though further research will be needed before an initial date can be reliably determined. Another early site is that of Trigo, which is said to have a date of 360 B.C. "associated with Marianas Red pottery" (Shutler 1978:223). Additional details concerning this site do not seem to be available. The next earliest date for Guam is from the Talofofo river valley, which indicates the presence of a inland settlement by at least 2,220 ± 90 B.P. (calibrated date of 545-20 B.C.; Reinman 1977:30). Unfortunately, Reinman does not indicate whether the date is derived from charcoal, though it is assumed to be for the calibration. Of interest is his mention that there was a later date in a lower and presumably earlier but disturbed stratum (Reinman 1977:31).

After 2,200 B.P., radiocarbon dates become increasingly common in the Mariana Islands up until the advent of regular

western contact in the last decades of the 16th century (on Guam). There is little doubt that scattered settlements were present throughout each of the major islands by 2,000 B.P., and that population size began to rapidly increase after that time.

Pre-Latte and Latte Periods

The prehistory of Guam is generally viewed as consisting of two major periods: the later latte period, and the earlier pre-latte period. The name latte refers to the large stone uprights and capstones on which houses where constructed. A house would have from 3 to 6 pairs of latte in parallel rows. There is considerable variation in size and height of such structures; some are clearly of megalithic proportions while others may be very modest in size. Latte structures are found throughout Guam and the other Mariana islands.

Pre-latte sites have not been associated with structural remains. Rather, they are defined primarily on the basis of pottery. The work of Spoehr (1957), focused on Tinian, Rota, and Saipan, identified Marianas Red pottery as a chronologically early type. This pottery was thin-walled and covered with a red slip. A later pottery type, Marianas Plain, was much thicker, had thickened rims, and often included such decorative elements as combed, trailed incised, or cord marked exterior surfaces. This pottery type, though present in the earliest levels, did not become predominant until the later part of the prehistoric sequence (Spoehr 1957:124). Spoehr also noted a highly distinctive and very rare type of pottery, which he designated as Lime-filled Impressed Trade Ware. This was associated with the Marianas Red pottery.

Analysis of materials from the deep stratigraphic excavation at the Muchon site by Takayama and Intoh (1976) confirmed Spoehr's observations on the pottery sequence, further indicating that bowls with flat bases and simple rims were early, and that jars with thickened, incurving rims and round bases were late (later Mariana Red wares are evidently intermediate, with rounded, angular margins between the base and side wall). Unlike Spoehr, however, Takayama and Intoh (1976:25) indicate that the appearance of the "characteristic type" of Marianas Plain did not begin until Layer III, which is well up in the nine layer stratigraphic column. They state that by about A.D. 700 Marianas Red pottery was completely replaced by Marianas Plain pottery. They furthermore note that Lime-filled pottery is not associated with the earliest Marianas Red ware levels (1976:23).

Essentially the same pottery sequence has been documented on Guam, though Reinman (1977) has suggests that temper variation

provides a less arbitrary means for distinguishing the ceramic types originally defined by Spoehr. He therefore designated Calcareous Sand Temper (CST) as the earlier type, and Volcanic Sand Temper (VST) as the later type. This need was made evident by the presence of numerous sherds in his collection having intermediate classificatory attributes. Furthermore, Reinman was able to distinguish only a few sherds that were clearly analogous to the Marianas Redware described by Spoehr (Reinman 1977:55). He attributed this paucity of Redware sherds to the intermediate age of his CST collection, believing Marianas Redware to be an early variant of this type not represented in his excavations (Reinman 1977:90).

Regarding the chronological significance of the temper types, Reinman (1977:157) cautions,

> It is assumed that those test pits and site units with the highest percentages of CST wares and Type A rims [parallel sided simple and everted rims] are the earliest. Decreasing percentages of each mean a decrease in the age of the stratum or site unit. While this is a reasonable assumption, the great variability in CST sherd and Type A rim percentages in alternate test pits in the same unit...or stratum...at Nomna Bay indicate that small percentage differences cannot be reliably used for <u>specific</u> chronologicalplacement of the site units relative to one another.

Though Reinman (1977:89) accepts Spoehr's (1957:124) date of A.D. 500 as the beginning of the <u>latte</u> period on Guam, it is not clear from his discussion to what extent the pottery change was gradual or abrupt. It is also unclear what the cultural implications for this change might be.

Pottery Analysis at Tarague Beach

Moore (1983), analyzing pottery from the deep stratigraphic excavations of Kurashina at Tarague Beach, specifically sought to clarify the chronological significance of a number of attributes. These included temper, thickness, surface decoration, rim form, and vessel shape.

With respect to temper, Moore (1983:172) notes that "not until after A.D. 800 did calcareous sand tempered sherds nearly

disappear from the archaeological record," and that temper was an ambiguous attribute for determining fine temporal intervals. Based on her analysis, for example, Moore (1983:83) believes that "pottery with predominately CST inclusions can either be extremely early in time or quite late."

At least part of this problem, however, may be due to Moore's giving too much weight in her inferences to data derived from the South Profile, which as previously mentioned, may be providing anomalous results due to the very small sample of pottery recovered--a total of just 418 sherds. In contrast, excavation of the adjacent Grid Squares produced a total of 3,777 sherds for the top three layers. Furthermore, just a little mixing in the top layer with sediments containing calcareous sherds would throw the temper percentage figures way off in the South Profile as there were a total of just 65 sherds. This is not an unlikely possibility as the site area has been massively disturbed by bulldozing (Ray 1980:28) for golf course fill. The South Profile, in fact is situated on the inside edge of a huge borrow pit, and others are in close proximity (Kurashina & Clayshulte 1983b:16; Kurashina et al. 1981:60). The Grid Squares, on the other hand, were placed on intervening "high" areas, which was presumably the original and undisturbed ground surface. Thus, sherd data from the South Profile are clearly problematical, especially in the top layer, and should not be given undue emphasis.

Another important consideration in arriving at inferences concerning the pottery is that the Grid Squares were excavated using a much finer degree of stratigraphic control. Here the layers were divided into 10 cm. thick levels. In contrast, the layers in the South Profile were each excavated as a single unit. Under such a circumstance it would obviously be much more difficult to evaluate whether frequency distributions have any consistent patterning due to the grossness of the analytical context.

Thus, if the South Profile percentages can be dismissed for the time being, it is possible to see an extremely consistent series of percentage ranges among the CST sherds in the Grid Squares. This is graphically indicated in Figure 2, where there are three distinct tiers or steps. Levels 1-4 have the lowest percentages, levels 5-8 are intermediate, and levels 9-13 have the highest. The temporal implications of these divisions are obvious. Clearly, the percentage of CST temper appears to offer excellent possibilities for assigning relatively fine temporal intervals to pottery collections that have stratigraphic integrity (i.e., undisturbed deposits). It is unfortunate that the Grid Squares were never excavated to basal levels as the much higher numbers of sherds and better sampling procedure (i.e., division of each stratigraphic layer into multiple levels) provide a much more reliable basis for archaeological inference.

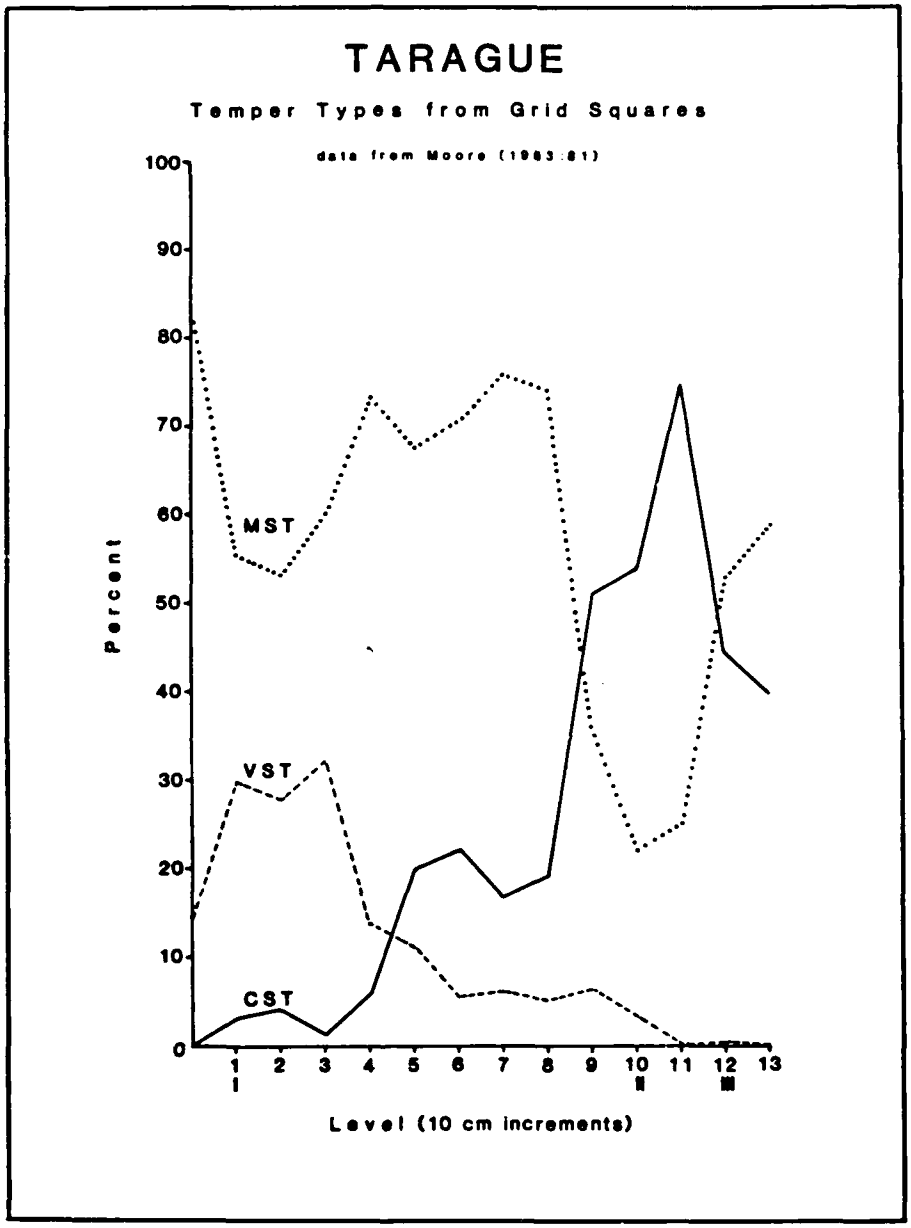


Figure 2. Graph of temper type percentages from Grid Squares at Tarague Beach. Excavations were conducted by Kurashina and Moore.

Another difficulty with the Tarague pottery analysis is that only a single radiocarbon sample was collected from layer I, which was from the South Profile at a depth of 70 cm. (Kurashina and Clayshulte 1983a:119; 1983b:10). This sample has a calibrated range of A.D. 630 - 1,045. In view of the probable greater reliability of attribute frequency data in the Grid Squares, it is indeed unfortunate that more radiocarbon dating was not undertaken in that area of the site, particularly at the levels where CST percentages have their greatest changes. With respect to the South Profile date, in terms of depth it appears to correspond to the 50-60 cm. level of the Grid Squares, though from Moore's statement that CST sherds nearly disappear from the archaeological record after A.D. 800, the 40-50 cm. level may be a more accurate point for correlation.

Volcanic Sand Temper and Mixed Sand Temper (both calcareous and volcanic sand) counts also provide potentially useful frequency distributions for chronological inferences, though they are not as finely graded into distinct frequency levels as the CST sherds in the top three layers. Also, there is some degree of frequency reversals between layers. The most consistent pattern seems to be the total absence of VST sherds from layers III, V, VI, and VII, with a 5.6 % figure for layer VIII (which had only 18 sherds) in the South Profile (layer IV was nearly sterile).

As to the use of temper for chronological inferences in the earlier layers, Moore (1983:89) states that a CST frequency of 50% or more reflects early occupations, by which she presumably means those older than 500 B.C. However, based on her Grid Squares table, where 50% frequencies begin in the basal level of layer I and continue downward, this date is probably much too early. Since this point is between the layer I radiocarbon date of A.D. 630 - 1,045 and the layer V radiocarbon date of 785 B.C. - A.D. 425, it is much more likely that the 50% CST figure (which should really be stated as 40% or higher, as indicated in Grid Squares temper percentage table) must signifiy a date of about A.D. 500 or slightly older. This revised age estimate, though seemingly more consistent with the information provided by Moore, must be subjected to evaluation with data from other excavations before it can be accepted as any more reliable than Moore's estimate.

Other combinations of temper frequencies can be derived from Moore's discussion to calculate absolute dates. However, before moving to more complex formulas of combinations of CST, MST, and VST tempers for particular time periods, it would be more productive to first test and refine the simpler formulations as given above. It is also likely that the more complex the temper chronology formulation, the less applicability it will have for other sites. Indeed, as will be recalled from the discussion of

Reinman's investigations at Nomna Bay, temper and rim type percentages can show considerable variation in adjacent excavation units.

Turning now to the thickness attribute, it is not surprising that Moore's (1983:92-94) study shows an inconsistency similar to the temper data in the upper layers between the South Profile sample and the Grid Squares sample. Although patterning is perhaps not as clearly evident as was the case with temper, enough thickness information is available to demonstrate that the frequent characterization of pre-latte pottery as thin-walled and latte pottery as thick-walled is probably erroneous. Part of the problem, as Moore (1983:98-100) explains, is due to the different way that Spoehr defined his pottery types. His Marianas Red sherds were clearly thin-walled; however, the non-Marianas Red sherds included in his early levels were classified as Marianas Plain, thereby segregating different types of vessels having different dimensional characteristics. A non-typological approach in which all vessel types are lumped together for analysis, as performed by both Reinman and Moore, leads to very different results. For Guam, this means that the top layer and lower layers have similarly thin-walled pottery, while the middle layers tend to have somewhat thicker pottery. Since red slipped sherds are difficult to define or rare on Guam, the thickness distinction noted by Spoehr (1957) cannot be readily applied to Guam. As Moore (1983:101) notes,

> Thickness as a means to order individual sherds according to their relative temporal placement may not be an acceptable criterion for Mariana pottery since a wide variety of vessels were apparently manufactured at any one point in time and over a broad time period. However, determining mean and range of thickness values for pottery samples may indicate their approximate chronological age.

Moore's reference to mean and range of thickness values concerns the comparison of graphed curves showing values at 2 mm. intervals. Her analysis using this data, however, is based on the small sample from the South Profile, and it is uncertain whether the distinctions she observes are in fact real or due to sample bias. This form of analysis, nevertheless, merits further application and should be pursued in future studies.

Regarding the chronological significance of a variety of surface treatment techniques at Tarague Beach, there are several apparently significant and useful results that emerged from

Moore's (1983) study. These include 1) impressed or incised designs on rims are almost exclusively a characteristic the bottom level of Layer I (12.5%) and the lower layers in the Grid Squares (more than 50%) and South Profile (more than 21%); 2) Lime Impressed pottery is limited to Layer V and VI, and is not associated with the earliest levels. This conclusion was also reached by Leidemann (1980) at the Ypao site on Guam's west coast (near Agana). The date for this pottery at Tarague Beach would be about about 500 B.C. to 0 A.D., based on both Ray's radiocarbon dates and finding of this pottery in his strata 4 and 5, and the South Profile radiocarbon date in Layer V. Dates by Birkedal (Moore 1983:116, citing Shutler 1978:223) for the Trigo site near Togcha-Ipan in Guam, and Takayama and Intoh (1976) for the Muchon site in Rota appear to confirm this time span. 3) The other important chronological indicators include combed, mat impressed, cord marked, trailed, wiped/brushed, and lime plastered, which all appear at approximately the 70-80 cm. level of Layer I in the Grid Squares, and continue in time to the top level. The beginning date for these styles is probably somewhat prior to A.D. 630 - 1,045, judging from the correlation of the Layer I South Profile date with Layer I in the Grid Squares (see above). Perhaps sometime in the A.D. 500 - 700 interval would be a satisfactory approximation for the initial use of these decorative styles (Moore [1983:173] suggests a date of A.D. 800, as Spoehr [1957:29] has also suggested for Tinian). Other surface treatments are of more limited use as chronological markers because they are either uncommon (e.g., slips) or else they occur over a very long time span (e.g., smoothing, burnishing).

Rim form is another pottery attribute analyzed by Moore (1983). In this case, the thickened Type B rims showed a clear pattern of chronological ordering. They first appear in the 60-70 cm. level of Layer I in the Grid Squares at a very low frequency, and quickly increase in the ascending levels until they reach 100% in the 10-20 and 0-10 cm. levels. The only unusual occurrence is the presence of a single Type B rim in Layer VI in the South Profile; otherwise the lower layers contain none. A date for the beginning of Type B rims is difficult to assign without additional radiocarbon dates, though it would probably be in the neighborhood of A.D. 700 - 800 (Moore [1983:174] suggests a date of "after A.D. 800"). Moore (1983:135-136) notes that this clear patterning in Type B rims as a late attribute does not seem to occur in southern Guam, given the findings of Reinman (1977) and Montvel-Cohen and Moore (1981:56-57). It should be further noted that the presence of Type A rims at Tarague Beach does not signify an early date; the chronological patterning only concerns Type B rims, which are relatively late.

Vessel shape, the final analytic parameter considered by Moore (1983), was only briefly considered because of the

difficulty of analyzing shape with only a limited number of reconstructed and partially reconstructed vessels. Using data from Ray's (1980) Tarague excavations and other vessels from Guam, Moore (1983:161) put together a seriation of shapes through time for the Marianas. In general, the seriation shows more complicated vessel forms being replaced by simpler forms through time. Carinated bowls with slightly rounded bottoms are characteristic of the earliest levels, followed by large flat-bottomed bowls with either vertical or slightly flared sides. These are then followed by globular pots with Type B rims, beginning by about A.D. 800. Moore (1983:160) notes that,

> the most abrupt changes in form occurred with the appearance of the robust bowls in Layer VI and the vessels with Type B rims of Layer I.

In terms of relating the pottery analysis to social processes on Guam, it is of interest to note that at the Tarague site a latte stone set was found adjacent to the area of excavation (Kurashina et al. 1981:60). Field observations indicate that the age of this structure, situated within layer I, must be between A.D. 1,000 and 1,200. This time period, therefore, places one of the major markers of the latte phase well after the pottery began to take on the appearance of what is commonly characterized as latte pottery, which was between A.D. 500 to 800 (temper seems to have changed slightly earlier than rim form and surface decoration, based on the preceding analysis). As Moore (1983:221, citing Graves 1983) notes, evidence for construction of latte prior to A.D. 1,180 is absent, while evidence for more recent construction is secure.

Before concluding this section on Guam's archaeology, mention may be made of a recent archaeological study conducted in the Tumon Bay area on Guam's west coast. This is a report by Graves and Moore (1985), which provides an in-depth review of historical information, previously collected archaeological data, and results of their own investigations at a number of sites. They document archaeological remains beginning at 340 B.C. (uncorrected shell date) and continuing through to the latte period.

Another recent study concerns a synthesis by Kurashina (1986) of the distribution of archaeological sites on Guam and the relationship of environment to settlement pattern. Among other points of interest, Kurashina notes that pre-latte sites are small and highly dispersed, while latte sites are both much larger and more numerous.

Chamorro Subsistence and Settlement Patterns

The earliest western contact with Guam was made by Magellan in 1521. Thereafter contact with the indigenous population was negligiable until about 1568 when Spanish galleon trade between Mexico and the Philippines was established and Guam became a provisioning port during the lengthy yearly journey. Spanish disruption of native life, therefore, probably continued to be minimal until 1668, which was when Fr. Sanvitores arrived in Guam with a group of soldiers and Jesuit priests to establish the Marianas Mission. In the early years of the mission, native opposition to the outsiders occasionally manifested itself. In 1674 unrest became widespread, and the Spanish military initiated reprisals against rebellious native villages until all were subdued. Military governors were in charge of Guam until 1680, by which time the native peoples were variously abandoning their villages and going to other villages, fleeing Guam to Rota, or moving to Agana, the Spanish administrative center. In this same year the Spanish imposed a resettlement policy to amalgamate the widely scattered villages and hamlets into larger units for better control. It is at this time and the few years preceding that traditional Chamorro life may be said to have become thoroughly disrupted. In 1668 one estimate placed Guam's population at 30,000 people inhabiting 180 villages. By 1690 there were only about 1,800 Chamorros on Guam (Cordy 1986, citing Repetti 1962:45). Whether the earlier population estimate is even roughly accurate is a question that clearly requires investigation.

When the Jesuits arrived in Guam, they established their base in Agana, which was reported to be the most important settlement on Guam. It was said to consist of over 200 structures; 53 belonged to "principals," while the remainder were occupied by common people. Other villages ranged in size from 6 to 150 houses, with coastal settlements being considerably larger than those located inland, which had less than 20 houses. Except for the northern plateau, all of Guam was occupied, given the availability of water (Moore 1983:28-29).

Three types of structures are said to have been found in villages. These were raised houses, low huts, and large boathouses. Other sources describe latte structures as raised houses built on stone posts, and divided into several rooms (Moore 1983:32, citing Plaza 1973:6-7). As a distinction was made by the early missionaries between houses occupied by the "principals" and those of the other residents, it is likely that latte structures were used by the higher classes (Moore 1983:33). Several different levels of social ranking clearly seems to be indicated for early contact Chamorro society, though details concerning social organization are lacking.

Archaeological research by Craib (1984:6), in which detailed mapping and excavations were conducted throughout a broad area of the Pagat latte site on Guam (the site covered 3 hectares and contained 10-15 latte), failed to find evidence for any non-latte structures. Also, all midden refuse was clearly associated with the latte structures. According to this study, therefore, latte structures should not be considered as prima facie evidence for social status; the absence of non-latte houses suggests that all social ranks lived in latte houses.

Evidence for supra-village political organization is ambiguous. Spoehr (1957:37) and Thompson (1945:12) both believe that several large villages were united under a single chief, forming regional polities. Cordy (1983), however, believes that the basic political and territorial unit was the village, which possibly controlled several outlying hamlets. The "principals" mentioned in the historic literature, according to Cordy, were probably lineage leaders with the senior lineage leader being the chief. This is quite similar to a model recently proposed by Craib (1984:13), though he seems to regard Chamorro society as less hierarchical than Cordy probably does. As a result of warfare, alliance formation between village polities was evidently common for both offensive and defensive purposes (Cordy 1986, citing Garcia 1683:65-70). Presumably such groupings were ephemeral. The presence of numerous slingstones in latte archaeological sites and in isolated contexts suggests that warfare and feuding may have been common on Guam.

Chamorro subsistence is not well documented in the early historic documents. Agriculture, however, is known to have included several varieties of taro and yam, bananas, coconut, and sugar cane (Moore 1983:35-37. Rice also seems to have been present on Guam in the pre-contact period (Pollock 1983), though its cultivation and use was apparently small. Breadfruit (*Artocarpus altilis*) may also have been cultivated. Other plant foods that may have been gathered include seeds of the wild breadfruit, nuts from the cycad tree (which could be ground into a flour), and arrowroot. The large mortars usually found between parallel latte sets were obviously an integral part of food preparation, though it is uncertain how they were used. These do not seem to have been present during the pre-latte period.

In regard to the northern plateau, Hornbostel (n.d.) adds the following comments concerning subsistence:

> ...although not habitable [the plateau] was a great source of food supply being well covered with Fadang (Cycas circinalis), which according to folk lore was the staff of life of the ancients. The

> moderns still use the flour made
> from the nuts of this plant for
> tortillas if no corn is at hand.

It is thus possible that the use of mortars was related to the preparation of this food.

Fishing was also an extremely important part of Chamorro subsistence. Both large open-ocean canoes and smaller canoes were used for this purpose. Fish were caught using both nets and hooks. The archaeological record attests to the presence of shell fishhooks, gorges, harpoon or spear points, and possibly composite hooks (Reinman 1977; Ray 1980).

With respect to domestic animals, pigs were probably not present in Guam before the arrival of the Spanish, and the same is probably true for dogs as well. Indisputable archaeological evidence for their presence prior to western contact is not available (Athens, Becker, Collins n.d.). Chicken, however, was likely present in the pre-contact period (Reinman 1977:141), though its status as a domesticate is uncertain. Other sources of animal protein during the pre-contact period probably included the fruitbat, turtle, various birds, and several other animal species of minor importance.

The Context of Chamorro Society in Micronesia

Linguistic evidence indicates a connection between the Chamorro language and the Autronesian languages of the Philippines (Spoehr 1957:174). Furthermore, the Chamorro language does not belong to the same "eastern Austronesian" subgroup as the other Micronesian languages. This latter subgroup--called Nuclear Micronesian--is more closely affiliated with Melanesian languages (see Dyen 1965). Thus, it appears that the western islands--Palau, Yap, and the Marianas--were probably settled from the west, perhaps the Philippines or Indonesia, while the central and eastern Micronesian islands were settled from eastern Melanesia (Alkire 1977:12; Bellwood 1979b:282). Lime Impressed pottery represents perhaps the clearest archaeological link of the Mariana Islands to the central Philippines. Marianas Red pottery certainly does not derive from the eastern Melanesian Lapita pottery, though both may have an ultimate origin in Island Southeast Asia (Bellwood 1979b:282).

Archaeological evidence thusfar suggests the very insular character of prehistoric Chamorro society. The pottery of central and eastern Micronesia (Truk and Pohnpei) is entirely different, and methods of house construction bear no resemblance to the <u>latte</u> of the Mariana Islands. These differences are even

evident when comparisons are made with Palau and Yap. Furthermore, dog was present in central and eastern Micronesia, while absent in the west. These and other technological differences suggest that the prehistoric Chamorro played virtually no direct role in island settlement and evolution of Micronesian society beyond the Mariana Islands. A suggested beginning date for the arrival of the first settlers to the Mariana Islands of 1,500 to 2,000 B.C. (as indicated by the recent findings of Bath) is much earlier than recent research seems to indicate for the initial date of settlement in central and eastern Micronesia, which also strongly suggests an entirely different heritage for the Mariana Islands. This also appears to be true for the Palau and Yap islands, which seem to have been settled much later than the Mariana Islands (see Masse et al. 1984; Takayama 1982).

It may also be remarked that while some investigators have argued for a major discontinuity between the latte and pre-latte periods with possible replacement of the earlier population by a new wave of migrants (e.g. Thompson 1969:54; Ray 1980:248, seeing a major stratigraphic discontinuity at his Tarague excavations, implies population replacement without being explicit). However, the bulk of the evidence throughout the Mariana Islands is much more supportive of population continuity through time with the gradual though non-synchronous evolution of elements of material culture (see Reinman 1977:58; Spoehr 1957:174; Moore 1983:216-222). The only real evidence for outside contacts consists of the Lime Impressed pottery, which is found for only a relatively brief period during the pre-latte phase. However, the date of appearance for this pottery--perhaps 500 B.C. to 0 A.D.--is not associated with any significant evidence for cultural change or population replacement.

Research Objectives: Tarague Beach Field Investigations

Within the limits imposed by the project's scope of work (see Project Introduction), the most significant contribution of the present field investigations will be that of radiocarbon dating and pottery analysis. Specifically, an opportunity will be afforded to apply the results of Moore's (1983) pottery studies to a new area, thereby testing the applicability of her seriation of attributes to other locations. Furthermore, it should be possible to better tie in the latte period pottery to an absolute time scale with additional radiocarbon dates; heretofore there has been only Moore's (1983:65) single date of A.D. 630-1,045 at Tarague for a period having a duration of more than 1,000 years.

At the outset of field investigations it was anticipated that this project could possibly provide substantial new

information and additional radiocarbon dates concerning the earliest pre-latte period at Tarague, as documented by Kurashina and Clayshulte (1983a; 1983b; Moore 1983). But while pre-latte deposits were present, the remains were relatively sparse and yielded no radiocarbon dates. Also, it is believed that these remains probably pertain to the middle or late pre-latte period rather than to the earliest period.

Another research question to be considered concerns the characterization of prehistoric subsistence patterns at Tarague. This will include not only marine shellfish and fish exploitation, but terrestrial fauna as well. Dog and pig, for example, have yet to be found with certainty in prehistoric contexts, so present excavations would provide further documentation for either their presence or absence. Also, the study of shellfish remains has received only minimal attention in previous archaeological studies on Guam. The present project, therefore, provides an opportunity for additional documentation of several aspects of subsistence practices.

Last but not least of the research objectives concerns the critical evaluation of methodology in the study of Guam's prehistory. This has already begun with an overview of data concerning early settlement on Guam and pottery studies at Tarague. It will also be a strong theme in the analysis section of this report. Methodological rigor in both field and laboratory practices is critical if advances are to be made in prehistoric studies, and there is clearly much room for improvement.

CHAPTER 2

INVESTIGATIONS AT TARAGUE: BACKGROUND RESEARCH

Environment

The area designated as Tarague Beach extends from Mergagan Point on the west to Tagua Point on the east, encompassing a shoreline distance of approximately 5 kilometers (3.1 miles; Fig. 1; Photos 1-3). The interior boundary is formed by a steep (often vertical) escarpement of limestone approximately 120 meters (400 ft.) high. This escarpement bows inward from Mergagen and Tagua Points, forming a habitable littoral zone some 400 to 600 meters (1,300-2,000 ft.) wide in the center and narrowing to a cliffline-shoreline boundary at both ends. Elevation of this area, which is located behind a continuous sand beach, ranges from about 25 meters (80 ft.) at the escarpement base to 6 meters (20 ft.) at the sand beach boundary. Freshwater caves and springs are located in this area. The reef along Tarague Beach is well developed, having a width of about 80 (260 ft.) to over 200 (650 ft.) meters, with the west half being considerably wider than the east. A narrow channel through the reef is located in the center.

Vegetation behind the beach strand consists principally of an untended mature coconut plantation mixed with various other trees, including breadfruit (Artocarpus altilis), Barringtonia asiatica, pandanus (Pandanus tectoris), Morinda citrifolia, cycad (Cycas circinalis), chile pepper (Capsicum frutescens), wild yam (Discorea sp.), wild taro (Alocasia macrorrhiza), and various grasses, sedges, ferns, and vines (Moore 1983:21). Inland along the escarpement Ochrosia, and cycad are common. The beach strand vegetation consists largely of Scaevola with Casuarina common in certain areas.

During the period of fieldwork for the present project, numerous wild pigs were observed in the area. In addition, deer and monitor lizards are common. Also, the Tarague Beach area has Guam's only remaining colony of fruit bats (Moore 1983:21).

Moore (1983:22) classifies the Tarague Beach area into 5 major ecological zones, each of which offers distinctive resources potentially exploitable by human populations living in the area. These are 1) the open ocean, 2) the reef, 3) the sand flat (or coastal plain), 4) limestone terraces, and 5) the plateau. Further details are available in Moore (1983:22), and Ray (1980:29-31) also offers a similar discussion. The main point is that, considered from an environmental perspective, the Tarague Beach area offers a highly suitable location for human settlement, providing easy access to all necessary resources. These include marine foods, agricultural land, fresh water, fuel wood, and construction materials. The biggest detractions to settlement appear to be storm waves, which would affect at least parts of the coastal plain where garden plots and houses would be

located (it is uncertain how far inland storm waves might travel), and strong ocean currents, which might impede access to open ocean fishing.

History and Land Use at Tarague Beach

The earliest reference mentioning the Tarague area found during investigations for the present project is located in the account by Father Francisco Garcia, published in 1683. This book is a history of the Jesuit missionary, Father Diego Luis de Sanvitores, who established Guam's first mission and was subsequently martyred. The account covers the period between 1668 and 1681. The source consulted was that of Higgins' partial translation, published in the Guam Recorder between September 1936 and July 1939.

For the year 1675 Garcia mentions that "some five hundred" people from San Miguel de Tarragui (i.e., Tarague) came to church services (Garcia [October] 1938:11). The context of the discussion suggests that these were all adults, which in turn suggests a substantial population for the area. Reference is later made to "the village" of San Miguel de Tarragui (Garcia 1938:11), suggesting that the Tarague Beach area contained a single nucleated population, probably comprising a single political unit. Evidently the village had a church at this time.

With respect to subsistence, Garcia notes that children, coming to school from their homes in the country, are "laden with the roots which are their regular food..." (Garcia [October] 1938:11).

Garcia also recounts the new governor's trip to Tarague, who had heard about the rebellious villagers there and wished to administer punishment. This occurred in 1678 (Moore 1983:30). It is stated that,

> They started at two in the afternoon and walked nearly all night but could not get to Tarraqui for the trails were overgrown. They went to another nearby village called Apoto [Haputo], in which Aguarin lived
>
> ....The Spaniards sacked the village and set fire to the houses, then returned to Agadna, happy because they had given the new Government such a splendid beginning.

> The destruction of a village so brave and so well fortified as this one struck terror to the hearts of the Indios (Garcia [April] 1939:13.

This passage both suggests the remoteness and general isolation of Tarague, and also that it must have been one of the more important of the Chamorro villages in order to merit such attention from the Spaniards and also to be a center of rebellious activity. Unfortunately, no mention is made of the number of houses in the village. Two years later all of the inhabitants of the north coast were resettled at Inapson, a newly constructed village on Guam's northeastern coast (Ray 1980:27-28).

Garcia also mentions that "three native Principals of Tarraqui had been prisoners in Agadna since long before the arrival of the galleon" (Garcia [May] 1939:58). This is another indication that Tarague must have been a village of some importance.

During the next several centuries little information seems to be available about Tarague. No churches are recorded in the northern half of Guam after 1700 (Moore 1983:30), suggesting that the Chamorro population in this area must have been quite small. However, an account by Villalobos (1969:17) in 1833, describing the presence of several ranches, a freshwater cave, a well, and coconut trees, indicates that the area had not been totally abandoned. There does not appear to be additional information concerning Tarague in the 18th and 19th centuries.

In 1917 the Atkins, Kroll & Co. purchased a 300 acre coconut plantation at Tarague (Guam Recorder [April] 1926:12). The previous owner was a Japanese syndicate, which had started the plantation in 1911 (Ballendorf 1984:28). Ballendorf (1984:29) mentions that Mr. James Nelson, plantation manager, and his family moved to Tarague in the early 1920's, living in two furnished houses. They had a windmill to charge a generator for pumping water. Each month 20 to 30 Chamorro men processed copra and loaded it aboard the <u>Kevara</u> for shipment. Some livestock was also raised at Tarague. In 1930, in the face of a severely reduced price for copra on the world market, Atkins Kroll sold the Tarague plantation (Ballendorf 1984:32). It apparently remained abandoned until after World War II, when the U. S. Air Force took control of the area and established Andersen Air Force Base. Fierce fighting is said to have occurred at Tarague during the the American invasion in 1945 (Ray 1980:28). A Japanese battalion is said to have been stationed at Tarague, and hundreds of soldiers and civilians took refuge there during the invasion (Satoh 1982).

Presently the western half of Tarague Beach is used as a recreation area by Andersen personnel and their families. The eastern beach (beyond the central channel) has been little used except for ordnance disposal on the eastern margin. A firing range, howr ~ , has been established inlard. Ray (1980:28), as previous', noted, reports that just prior to his investigations in 1967 nd 1968 the Tarague area was subjected to "extensive bulldozi ig...in a search for humus-laden soil to surface a golf course under construction on the air base."

In an effort to obtain additional information about the historic period at Tarague, the map collection at the M.A.R.C. library was consulted. An undated map, almost certainly prepared prior to Duperrey's map of 1819, shows a single wooden house at Tarague with a trail or road leading to it. This map is titled "Croquis de la I'a de Guajan." Further research would almost certainly enable the determination of a date. This map is important because it evidently do_uments very limited use of Tarague following the Chamorro resettlement.

Duperrey's 1819 map, while not showing houses, does indicate that Tarague had two different place names: the east side is labelled "Tarrague," and the west side is labelled "Toburi" (or something similar--the letters are difficult to distinguish). The only other map to make this distinction in place names is one by La de Freycinet (J. Henry Baird), also dated 1819. This map is titled "Essai sur la geographie ancienne de L' Ile Guam." Though the cartographic style is totally different from the Duperrey map, it is possible that one made use of the other as a source of information.

Of the later maps, the one titled "Instrumental Survey of 1913-1914; Triangulation from Navy Dept. Survey of 1901-1902 (sheet 1)" is the most interesting. This map shows the coconut plantation as being largely confined to the east half of Tarague. A road or trail runs along the edge of the plantation on the ocean side. Another map, titled "Corps of Engineers Tactical Map," dated 1922, identifies the road symbol as "unsurfaced road." This same road (or trail) appears on the undated but probable earliest map depicting Tarague (Croquis de la Ia. de Guajan), but not on any of the other 19th century maps.

In summary, historical records clearly indicate that Tarague was the location of an important and probably fairly large Chamorro settlement in the early years of the Spanish occupation on Guam. It is likely, therefore, that this same settlement was a continuation of precontact habitation at Tarague. Tarague was then abandoned as a result of the Spanish policy of resettlement. There is some evidence for use of the area by a small number of Chamorros in the early 19th century. In the early 20th century a large area of Tarague--apparently primarily the eastern part--was

brought under copra production, initially by a Japananes firm and subsequently by an American firm. The latter had a resident manager. The plantation was abandoned in 1930. During World War II a Japanese battalion was stationed at Tarague. With the American Defense Dept. acquisition of the area after the war, Tarague was used principally for recreational purposes on the west side, and ordnance disposal and a firing range on the east side. Massive land disturbance of the area occurred during the mid 1960's when humic soil was excavated and removed by bulldozers for golf course fill at Andersen Air Force Base.

It is clear from this information that archaeological remains from both the precontact period and the historic period may be expected at Tarague. Although previous archaeological reports have barely mentioned the potential of the area for historical archaeology, it is obvious that remains of outstanding research potential concerning the early period of contact may be present. The importance of the prehistoric remains, of course, is substantial, as other investigators have already indicated. There is furthermore the interesting possibility of archaeologically documenting the remains of an early copra plantation. Unfortunately, however, the massive degree of land disturbance for golf course fill may have obliterated some of these archaeological remains, though the extent of such disturbance remains to be determined.

Previous Archaeological Investigations at Tarague

Archaeological observations at Tarague have been made by 5 different investigators between the 1920's and 1980's. In addition, completed but not submitted National Register forms provide a compilation of information about the site, as does the thesis of Moore (1983). This section will summarize this information in as great of detail as possible in an effort to define the nature and extent of presently known archaeological deposits at Tarague. Maps will augment the discussion in an effort add precision to the location of known deposits. None of the previous reports are truly comprehensive in their treatment of the site.

The earliest archaeological observations at Tarague were made by Hans G. Hornbostel between 1921 and 1923. Though Hornbostel never published a report, his field notes are on file at the Bishop Museum library in Honolulu. Thompson (1932), later published on these notes, though her report does not contain Hornbostel's observations on the Tarague area.

In the course of his investigations, Hornbostel prepared a map showing archaeological locations on the northern end of Guam

(Fig. 3). This map shows several trails leading down to Tarague, with the Atkins Kroll Ranch apparently located on the eastern side. The map also shows 10 latte sets spaced nearly evenly across the entire beach. While most latte sets in Guam tend to be oriented parallel to the beach, those on the western side of Tarague are described as being perpendicular (see map in Hornbostel n.d.). Unfortunately, however, detailed drawings of the Tarague latte were apparently not undertaken by Hornbostel.

Hornbostel, besides mapping the distribution of latte sets, conducted excavations at one 6-stone set (which one is not identified). Here a single extended burial and several skulls were found. The excavation is illustrated in Hornbostel's (n.d.) notes, and there is also a brief written description.

Hornbostel (n.d.) also mentions the exploration of Mergagan Cave (see Fig. 3; it is labelled "Tarague Cave" on U.S.G.S. maps [see Fig. 1]). Thompson (1932:20) reports that "drawings," presumably petroglyphs, were found on the cave walls. Unfortunately, information on Mergagan Cave was not retrieved at the time Hornbostel's original notes were consulted by this author. Thus, it is probable that additional details may be found with further investigation of these notes.

Following Hornbostel's work, Douglas Osborn conducted investigations on Guam just after World War II. In a manuscript titled "Chamorro Archaeology" (1947), which is on file at the M.A.R.C. library, Osborn's only mention of the Tarague area concerns a statement that,

> From Oruno around the whole northern to northeastern coast on the island [Guam] there is a continual archaeological area (Osborne 1947:47).

Unfortunately, further details documenting the basis of this observation are not given. Ray (1980:35), however, notes that in a personal communication to him Osborn stated that he had visited Tarague Beach "but had made no discoveries of any magnitude."

Some years later, in a 1952 report prepared for the U. S. National Park Service, Erik Reed (1952:110) mentions that he visited the Tarague area and observed no latte structures. He does say, however, that

> Any sites there are likely to be disturbed unless Air Force excercises care in road construction and recreational development.

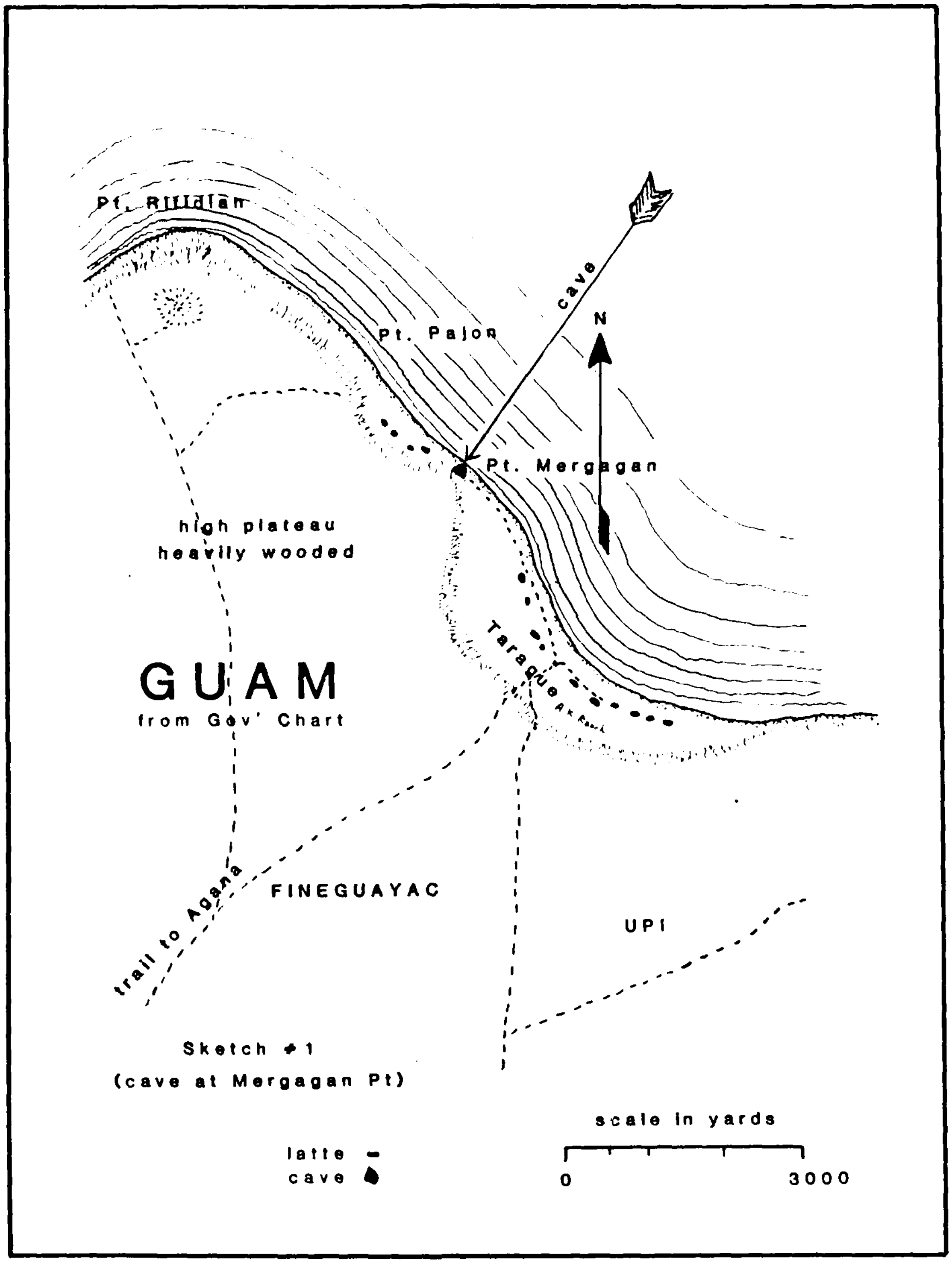


Figure 3. Map of latte structures at Tarague prepared by Hornbostle (n.d.) and redrafted by J. S. Athens. The latte are shown as black dots along the beach.

This statement has been interpreted by Moore (1983:48) to mean that the latte structures at Tarague had already been destroyed by farming and military activities. However, in view of the above quote, it seems more likely that Reed did not inspect the area very intensively and felt that some of the latte structures may have been still present. But since Reed does not describe how he conducted his field investigations at Tarague, it is impossible to know with any certainty just what he meant.

The next investigations of Tarague were by Reinman in 1965. Reinman's published account provides only a general map archaeological sites on Guam that shows the entire Tarague area to consist of a site (1977, Fig. 1). His descriptions of the area are confined to his unpublished field notes (n.d.1) and his preliminary N.S.F. grant report (n.d.2).

Reinman's survey of Tarague was conducted between September 23rd and 27th, 1965 with two days off for a wasp sting (n.d.1). The ground survey was what would now be referred to as "intensive" between the beach and road (see map, Fig. 1). The area inland from the road was sampled with only 2 transects to the cliffline, which produced a few scattered sherds and coral paving in two areas (Reinman n.d.1:59).

Within the area of intensive survey, the western side of Tarague (which Reinman mistakenly refers to as the "northeastern section of beach") had variable concentrations of pottery, some places having only a few pieces and others many. At the west end of this area there is a small knoll with arachaeological midden eroding from under 50 cm of sterile sand. The precise location of this knoll is not given. In the central area of Tarague (near the channel), however, the pottery concentrations were very dense beginning about 50 meters back from the beach. Some of the pottery was concentrated on low mounds, which appeared undisturbed. Moore (1983:48) places this archaeological zone from approximately the 7 meter contour to near the road and well #4. The area to the east of this central area also had abundant archaeological remains throughout (Reinman indicates "the 5-10 meter contour is nearly a solid sheet of pottery"), though apparently not nearly as dense as in the center. It was here, however, that Reinman located his only latte set, which consisted originally of 8 stones of which 6 were more or less in place. Reinman located this latte set near the CE beach, which is the beach area shoreward from where the unpaved road curves around the Rifle Range (see map, Fig. 1).

To summarize Reinman's findings, virtually the entire length of Tarague contained archaeological remains inland from the beach. These remains extend only to the paved road on on the western side, though they they are found beyond the road (toward the cliffline) on the eastern side. In general, however,

archaeological remains are much more limited inland near the cliffline. By far the area of densest remains was situated in the central area of Tarague slightly inland from the beach where the channel is located. Only a single more or less complete latte set was found during the survey, and this was located just east of the channel. A few badly disturbed remnants of other probable latte sets were also seen (n.d.2:9). Ground disturbance was apparent in a number of areas, but apparently this was not the case everywhere. Reinman nevertheless believed that "most of the surface layers have probably been disturbed" (n.d.2:9). Reinman did not conduct excavations.

Ray's (1980) investigations closely followed those of Reinman, having been conducted during the period between 1967 and 1968 when he was stationed at Andersen Air Force Base. There was no financial support for the project, though considerable cooperation was forthcoming from the University of Guam, which also supplied student volunteers. Ray's survey, though conducted with a knowledge of Reinman's work at Tarague and other areas of Guam, did not have the benefit of any published or unpublished results. His investigations were primarily concentrated in the central beach area and along the beach strand. No standing latte were found, and only two areas had fallen latte stones, and these had been covered by bulldozing debris (Ray 1980:41). The major orientation of Ray's work, however, was not survey but test excavations. He placed a total of 12 units over a broad expanse of the Tarague area (see map, Fig. 1). Ray (1980:41) notes,

> Excavation sites were selected from "islands of undisturbed ground or from disturbed areas where it appeared probable that some cultural materials remained unexposed.

As Ray (1980:41) explains, the bulldozer operators, in their search for suitable humic soil to use as golf course fill,

> ...followed a pattern of constant testing to find the areas where dark humic soil existed, which were concentrated in places where previous human activities were carried on.

The locations of Ray's test units have been plotted onto the map of Fig. 1 using primarily the locational data provided by Ray rather than his location map (Ray 1980:42), which proved difficult to interpret. As such, these locations should be considered as only approximate due to the lack of precise information. The following list provides the size and depth of each of his excavation units:

TP-I	6 m^2	1.6 m deep
TP-II	1 m^2	0.88 m deep (top 0.8 m removed by 'dozing
TP-III	2 m^2	1.75 m deep
TP-IV	3 m^2	0.6 m deep
TP-V	3 m^2	0.6 m deep
TP-VI	14 m^2	3.0 m deep
TP-VII	30 m^2	3.0 m deep
TP-VIII	surface collection only	
TP-IX	small stratigraphic trench	
TP-X	? m^2	0.6 m deep
TP-XI	4 m^2	0.9 m deep
TP-XII	? m^2	0.3 m deep

Ray (1980:70) notes that only TP-VI and TP-VII contained pre-latte pottery; all other units except culturally sterile TP-10 contained latte period pottery. TP-X was located in a cave 35 meters inland from the shoreline (not Mergagan Cave, which was 75 meters south and near the beach, [Ray 1980:67]). TP-XI contained water-worn redeposited archaeological deposits, suggesting disturbance by a typhoon or storm waves (Ray 1980:68).

Because of their apparently continuous record of human occupation since the initial occupation of Tarague Beach, Ray decided to concentrate his analyses on TP-VI and TP-VII (Ray 1980:58). TP-VII contained particularly abundant pre-latte deposits. Two radiocarbon dates were obtained from charcoal found in hearth features in Stratum 3 and Stratum 5. The dates are B.C. 405 - A.D. 30 and B.C. 365 - A.D. 220, respectively. Ray believes that both hearth features could possibly be intrusions from stratigraphic units immediately above those that were dated (Ray 1980:60, 63). The basis for this assertion is not given, and there are no stratigraphic profiles showing the features. As previously noted, Moore (1983:65) indicates that Ray's Stratum 5 probably correlates with Layer VI of the South Profile excavations (see below).

Ray's investigations, though obviously important for the archaeological material recovered and especially the extensive pre-latte deposits, are also highly significant in that they confirmed Reinman's findings of archaeological deposits over much of the near shore area of Tarague. Unfortunately, however, Ray's documentation of his excavation procedures and stratigraphic control was rather limited, nor was any attempt made to date the latte period deposits or determine contemporaneity of deposits in the different test units. The presence of historic artifacts was not indicated for any of the test units. Substantial documentation is provided for a wide variety of prehistoric artifacts.

The latest field investigations at Tarague (other than the present project) were those directed by Kurashina (Kurashina et

al. 1981, Kurashina and Clayshulte 1983a; 1983b). These investigations were limited to excavations in the central area of Tarague and just inland from the reef channel (see map, Fig. 1). Two adjacent areas were excavated and these were near Ray's TP-VI and TP-VII (the exact locational relationship between Ray's and Kurashina's excavation units is not known, though Moore [1983:65] notes that the South Profile is 30 meters closer to the reef channel). These are the South Profile and the Grid Squares, the latter consisting of 12 units of 1 x 1 meter (total of 12 m^2). The area excavated in the South Profile measured 2.8 x 1 meters (2.8 m^2). Excavation of the Grid Squares reached a maximum depth of 1.3 meters; only two units reached Layer III, and three reached Layer II (the rest were limited to varying depths of the Layer I deposits). The maximum excavated depth of the South Profile was 6.2 meters below the surface. A total of 10 stratigraphic layers were defined (Kurashina and Clayshulte 1983a and 1983b), with the base resting on limestone bedrock. This bedrock has been tentatively identified as the Merizo limestone, which is dated to about 3,600 years B.P. (Moore 1983:61, citing Easton et al. 1978). Cultural materials, however, were found only to a depth of 3.06 meters below Alpha Datum in 8 stratigraphic layers (Moore 1983:61), the bottom 2 layers being sterile. According to Moore's profile (1983:64), the actual thickness of the 8 cultural strata (from the surface to the base) is 3.275 meters. This is only slightly thicker (by 0.275 meters) than the total thickness of the archaeological deposits defined by Ray in his TP-VII (see Ray 1980:59).

The badly disturbed remains of a stone latte structure were found next to the excavation units. At least one of the uprights was in its original position. Other remnants suggested that the structure was oriented perpendicular to the beach (Moore 1983:57).

As was the case with Ray's work, the primary significance of Kurashina's investigations at Tarague has to do with the abundant latte and pre-latte remains that were recovered. The generally excellent documentation provided on the excavation and analysis of this material is particularly significant (see especially Moore 1983). Details concerning pottery from the South Profile and Grid Squares and the associated radiocarbon dates and chronology were presented in the previous chapter and will not be repeated here. Suffice it to say that a wealth of prehistoric remains were recovered. Early historic artifacts were apparently absent.

The only remaining information concerning the extent and nature of the Tarague archaeological remains is found in the National Register of Historic Places nomination forms prepared by Mr. Joseph O. Boda, former Supervisory Environmental Engineer at Andersen Air Force Base. These forms, which have never been

submitted, are dated May 11, 1984. The description of the site area and accompanying map provide complimentary (and overlapping) information with what has already been presented. While the nomination data can not be considered complete, it does provide some new details, and the map (reproduced in redrafted form in Fig. 4) is helpful in evaluating the distribution of archaeological remains at Tarague. The numbered site areas indicated on the map (see Fig. 4) are described as follows (briefly summarized here):

1. This is the location of the excavations by Ray and Kurashina.

2. This location has a partially exposed burial, numerous pottery sherds, shell tools, jewelry, and a monolithic mortar. These items were uncovered during work on the dirt road, and are distributed along an area approximately one mile in length. [It is presumed that this burial is the same one excavated during the present project].

3. This is the site of a 13 x 4 x 4 meter pit used for detonation of expendable ordnance. The pit walls contain a distinct layering of numerous archaeological artifacts. There are also numerous surface artifacts scattered throughout the area, and evidence to suggest that the area may be a prehistoric cemetery.

4. This area is located at the far eastern end of Tarague and contains numerous prehistoric mortars ground into a limestone outcrop at the foot of an uplifted terrace.

5. A freshwater cave is located here. The water quality is excellent and the water exchange is rapid. It would have been an important resource for people inhabiting the area. There are no known archaeological manifestations in or around the cave.

6. This area is located at the northern end (western extremity) of Tarague. Surface artifacts are scattered throughout the area. Archaeological remains are not as dense as in Areas 1 through 4.

7. This is the location of latte stone quarry on the reef. Quarrying was not completed and the latte stone remains in place.

8. This is the location of numerous latte stones. They have not been examined in detail.

The nomination form also adds that during storm events sand and gravel may be transported as far as 30 meters inland.

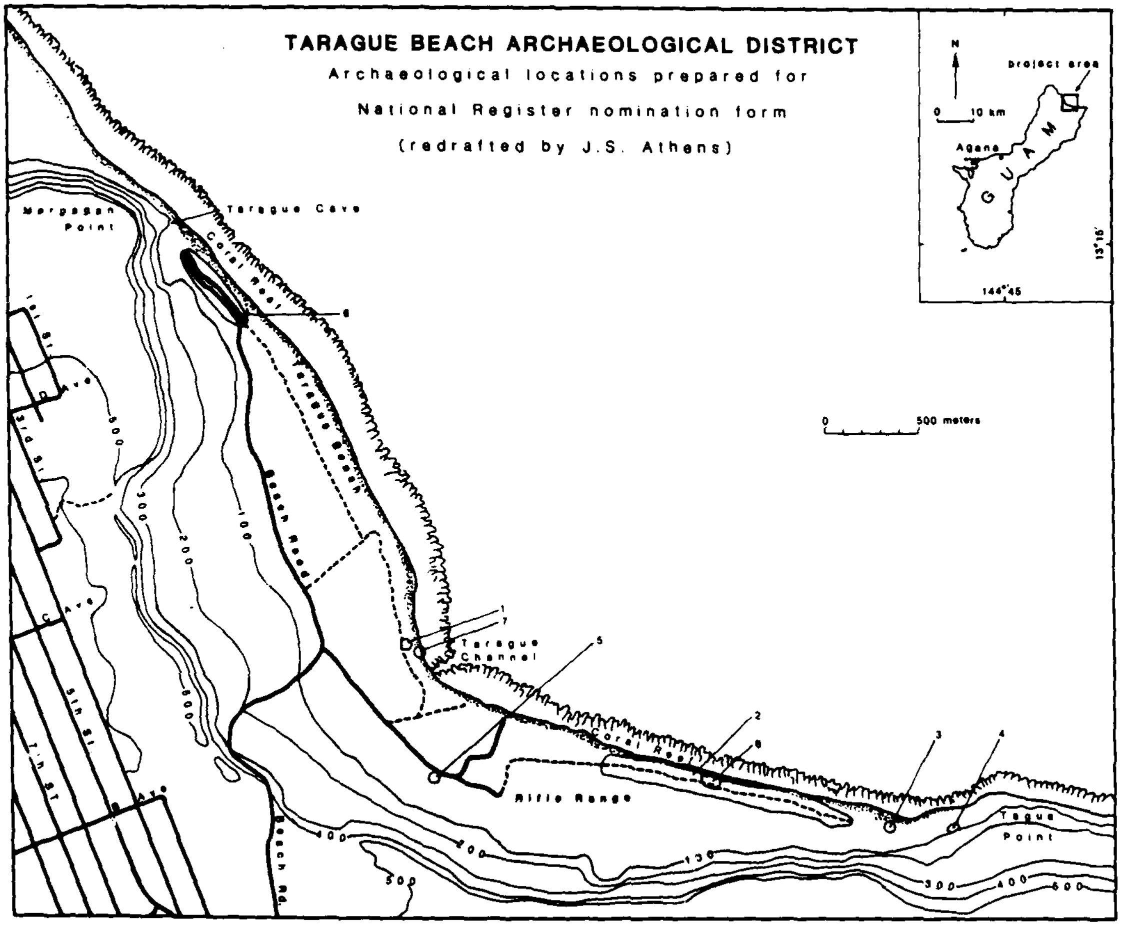


Figure 4. Map of Tarague Beach Archaeological District showing known archaeological locations. Map was originally prepared for National Register nomination form, which was never submitted. It has been redrafted by J. S. Athens for inclusion in the present report.

Distribution of Archaeological Remains at Tarague

The previous section summarizes all presently known information concerning previous archaeological investigations at Tarague. Although a substantial amount of research has been conducted, the efforts have been neither systematic nor coordinated, and the various investigators have each had differing goals motivating the conduct of their fieldwork. For these reasons, then, it is not possible to be precise about the nature and distribution of archaeological remains at Tarague. However, for management purposes a few general statements may be made.

First of all, the entire area between Mergagan Point and Tagua Point between the shoreline and base of the limestone cliffs (at the 100 ft contour as defined in the map accompanying the unsubmitted National Register nomination forms--see Fig. 4 in this report) should be considered to contain potentially significant archaeological remains at this time. This area should include Mergagen Cave (labelled Tarague Cave on recent maps, including Fig. 4), which is not specifically mentioned by the National Register nomination form.

Second, presently available information suggests that much of the area on the cliff side of the paved Beach Road and Firing Range (but not further east) probably has few archaeological remains. However, it must be stressed that adequate archaeological survey has not been conducted in this area and more information is needed before a final evaluation can be made.

Third, The central area, because of the presence of substantial early stratified archaeological deposits, should be considered extremely sensitive and special care should be taken to avoid further impacts to this area. The later latte period remains are also substantial in this area.

Fourth, present investigations (this report) indicate that substantial archaeological deposits are located on the eastern side of Tarague (see map, Fig. 1). These are the same areas defined as locations 2 and 3 on the nomination form (see Fig. 4).

Fifth, it is apparent that there are least 3 possible sets of latte structures still extant at Tarague. These include the structure mapped by Kurashina and Moore (Kurashina et al. 1981:60, Kurashina and Clayshulte 1983b:16). Moore (1983:57-60) provides further details concerning this structure. A second latte set is reported by Reinman for the CE Beach area just shoreward of the Firing Range. A third set is indicated by the National Register nomination form for Area 8 (see Figure 4). These remains have not been described.

Additional information about the status of knowledge concerning the distribution of archaeological remains at Tarague will be provided in Chapter 6 of this report in which recommendations are discussed. Also, comments concerning suggested future investigations and site management of the Tarague Beach Archaeological District will be provided in Chapter 6.

CHAPTER 3

INVESTIGATIONS AT TARAGUE: FIELDWORK

Introduction

Fieldwork at Tarague consisted of the excavation of 5 excavation units, each 1 meter square, and the profiling of the burn pit. Excavation units 1 through 4 were placed on and adjacent to the dirt road where the single disturbed burial was located (see map, Fig. 1). Units 1 through 3 were placed at the burial location, with unit 1 centering on the skeletal remains visible from the surface. Unit 4 was placed outside the area of road grading disturbance to evaluate the nature and extent of deposits that were presumably present before the road was built.

The burn pit profile consisted of a section of the south face of the pit 16 meters long. Excavation unit 5 was placed next to this profile so that archaeological remains could be systematically collected, thereby providing a basis for interpreting and evaluating the significance of information documented in the profile.

Methodology

All excavations were conducted with the use of hand tools, principally the trowel. Careful attention was paid to maintaining strict stratigraphic control of all samples. In the case of thin stratigraphic units, usually less than 10 cm., no subdivisions were made, and the unit was excavated as a single level. However, thicker units were divided into two or more levels. All levels for each excavation unit are numbered in sequence from the surface and these constitute the primary stratigraphic references. Layer designations are indicated by Roman numerals in the profiles, and of course are indicative of major depositional episodes. Individual excavated levels do not cross-cut or overlap layer boundaries insofar as these could be determined.

Datums were established for each of the excavation units (units 1 through 3 had the same datum), which served as the primary vertical point of reference with the use of a line level. Each level was described at the time of excavation on a standard form used for the purpose, and a field catalog was maintained for recording all collected material and associated information. Field collection bags were numbered and labelled in the field at the time of collection. Observations on soil and other characteristics of each excavation level were also made at the time of excavation, and the presence of artifacts, charcoal, firecracked rock, shell midden, bone, etc. was noted as well.

All archaeological sediments were screened after first determining their volume using graduated buckets. The latter was

undertaken so that a precise determination of the density of artifacts and midden could be made. Screening was performed in 1/4 inch and 1/8 inch wire mesh screen. In the case of excavation units 4 and 5, all screening was in 1/8 inch screen. In excavation units 1 through 3, the mesh size varied somewhat in each unit in accordance with conditions and goals of the excavation. Details are given in the discussion of these units.

Upon completion of the screening of each bucket of sediment <u>all</u> the residue left inside the screen was placed into a labelled cloth collection bag. No attempt was made to sort artifacts in the field, though artifacts collected in situ were collected and bagged separately. Upon completion of fieldwork, all collection bags were shipped to Honolulu for laboratory sorting.

A photographic record using 35 mm black-and-white and color film was made of each excavation unit before, during, and after excavation.

Upon completion of excavation, each unit was profiled on at least two sides (excavation units 1 through 3 were profiled upon completion of the series). This was followed by backfilling of the excavation pits.

A transit map was prepared of the burial location excavation units, with particular attention being given to the shooting of a profile transect across the area of investigation (Fig. 5). The latter was done for the purpose of determining the exact amount of disturbance the area had undergone as a result of road grading.

With respect to the burn pit profile, the basic methodology was to clean the south face with shovels and trowels, disturbing as little of the in-tact cultural deposits as possible. The south face was chosen because it had the best evidence for archaeological deposits. A level line was then placed across the face as a point of reference for vertical measurements. A meter tape was also attached to this line to provide a reference for horizontal measurements. The profile was then drawn on K & E metric graph paper. Notations were made regarding the presence and location of cultural material observed in the profile. Assistance in the interpretation of the lengthy profile was provided by Mr. Chuck Streck and Ms. Jane Allen, who provided a number of insights.

Excavation Units 1, 2, & 3

This series of excavation units, along with #4, is located approximately 100 meters (328 ft.) inland from the shoreline and 840 meters (2,755 ft. or one-half mile) east of the central reef

channel. This location is immediately north of center part of the cleared field used as a firing range (see Photo 1). Elevation above sea level is estimated to be 7 to 8 meters (23 to 26.2 ft).

As Figure 5 indicates, Excavation Units 1, 2, and 3 were placed adjacent to one another. The same datum was used for all three units, and the same level depths were maintained for all three units. There was variation in the screening procedure, however. Each of the 7 levels in Excavation Unit 1 was screened with both 1/4 and 1/8 inch screen, with about half the sediment going into one of the screens and the other half into the other screen. Excavation Unit 2 was screened entirely with 1/4 inch screen except for levels 7 and 8, which were screened in 1/8 inch screen. In Excavation Unit 3 only levels 1, 7, and 8 were screened with 1/8 inch screen; the other levels were screened with 1/4 inch screen.

The reason for the change to 1/8 inch screen in the basal levels of Excavation Units 2 and 3 was due to the presence of a slight amount of charcoal flecking in these levels that could be best recovered with the smaller screen size. Otherwise, results from the 1/8 inch screening performed in Excavation Unit 1 did not appear to warrant use of the finer mesh screen in the other units.

The place of excavation was determined by the location of the burial, which had been marked with a small pile of coral rocks by the side of the road (Photos 4 and 5). The burial itself was covered by a piece of plastic sheeting with dirt and small cobbles placed on top so that only the edges of the sheeting were visible. This sheeting formed an oval of approximately 70 x 37 cm. (2.3 x 1.21 ft.) 1.15 meters (3.77 ft.) north of road edge. The burial had initially been exposed in May of 1983, and Joe Boda of the Andersen Air Force Base Environmental Section had covered it (personal communication, Richard Davis). Presumably it had not been disturbed since that time. Since the road is used only infrequently by E.O.D. personnel, most of whom were aware of the burial, it is unlikely that anyone would have driven over it, especially since it was well off the road track. Grading of the surface, however, was obvious (see map, Fig. 5).

Inspection of the surface in surrounding areas indicated relatively dense concentrations of surface pottery on both sides of the road beyond the graded zone. The forest (mostly coconut, but also some hibiscus trees) grows right up to the edge of the graded area (Photos 4 and 5), suggesting that trees had probably been removed at the time of the grading. The graded area, except the road tracks, contains a dense stand stand of low plants and grasses (probably periodically cut by Andersen personnel). The

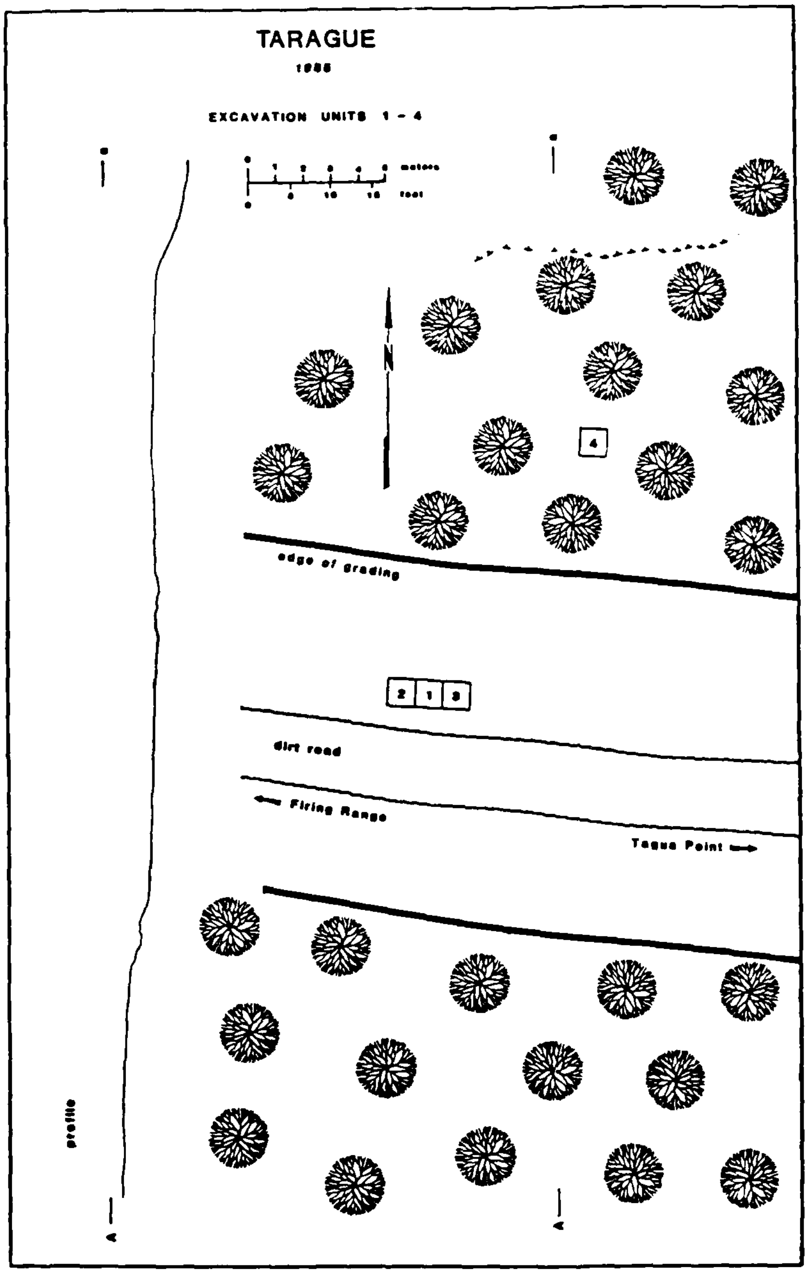


Figure 5. Location of Excavation Units 1, 2, 3, and 4; plan view and profile.

profile section (Fig. 5) indicates that road grading has removed approximately 35 cm. (1.15 ft.) of soil from the surface in the area of the burial. On the south side of the road, approximately 50 cm. (1.64 ft.) of soil has been removed.

The original scope of work called for the excavation of a 4 x 4 meter (13.12 x 13.12 ft.) area centered on the burial. However, initial inspection of the burial site made this amount of excavation in a disturbed area seem impractical and unwarranted in terms of potential information that might be collected. Furthermore, the scope of work stipulated that excavation would proceed only to a depth 15 cm. (0.49 ft.) below the level of the skeletal remains. Such a restriction would obviously limit the ability of the archaeologist to assess the significance of the deposits if they were found to continue to greater depths.

In discussing these problems with the archaeological monitor, Mr. Charles Streck, it was decided that the best approach would be to excavate a sufficiently large area around the burial to insure the recovery of all skeletal remains and determine the archaeological context, if still preserved. Furthermore, excavations should proceed to whatever depth the archaeological deposits terminated in order to fully evaluate the nature of the deposits and their significance. Additionally, an undisturbed area just beyond the graded zone should be test excavated in order to evaluate the nature and significance of the probable archaeological deposits that had been disturbed and removed by road grading in the area of the burial. Such an excavation would also provide further information on the archaeological context of the burial. Mr. Streck presented this change in work plan to the supervisory personnel in the Andersen Air Force Base Environmental Section, who concurred with this assessment.

Excavation Unit 1 was placed so as to encompass the entire area of exposed plastic sheeting. About 3 to 4 cm. of soil had been placed on the plastic, and when this was removed the underlying bones were clearly visible. Inspection showed the bones to be in a highly disintegrated and definitely disarticulated condition. The largest bone fragments were 5-6 cm. long; most were much smaller. The area around the bones in the rest of the excavation grid was then cleared. The bones were observed to be concentrated within an 83 x 30 cm. (2.7 x 0.98 ft.) area, which was essentially the same as what the plastic had covered. A thin dark organic soil deposit mottled with small patches of calcareous sand was observed outside the bone concentration (Photos 6 and 7). The bones were resting on light tan calcareous sand. No burial pit could be observed; all the bones were located in the top 8 cm. (0.26 ft.) of the deposit (levels 1 and 2). Various recognizable anatomical parts, such as

teeth and recognizable long bone fragments, were observed to be widely scattered in the burial area. This suggests that the bones were most likely disturbed and moved from their original location at the time of grading. Presumably, however, the original interment area must have been close to the excavated remains. Otherwise, the bone fragments would probably have been widely scattered rather than concentrated.

A small amount of bone was found in level 1 of Excavation Unit 2, and levels 1 and 2 of Excavation Unit 3. As in Excavation Unit 1, this bone was extremely fragmented. Approximately 94% (by weight) of all bone collected was from Excavation Unit 1 (approximately 525 grams).

A profile of the three excavation units is presented in Figure 6. Photos 8, 9, and 10 also show various views of the units following excavation. Three distinct stratigraphic layers were recognized. Layer I is a thin dark brown humic layer containing a large proportion of calcareous sand. It averages 2 to 4 cm. in thickness. This layer is thought to have been formed as a result of recent vegetation growth and does not appear to represent archaeological midden sediments. Charcoal flecking or other evidence that might indicate a cultural derivation was not observed, though a small amount of pottery was incorporated into the sediments. The lower boundary is abrupt and smooth, which is consistent with what would be expected for a bulldozed surface.

Layer II consists of nearly white calcareous beach sand with a mixed (course, medium and fine) grain size. It averages 40 to 50 cm. thick. The extreme west side of the profile shows what is obviously a disturbance--probably a crab burrow--extending from the top to the base of the layer. No bedding planes or any kind of stratigraphy was visible in the profile. It is basically a very homogeneous layer in terms of sediment matrix, though the sand tends to become slightly lighter in color toward the bottom. Charcoal flecks, while extremely sparse, were present throughout the layer. Pottery also tended to be extremely sparse in all levels except for #3, which had a an unusually large amount (8,500 grams per cubic meter vs. 1,000 grams or less per cubic meter for the other levels in Layer II). There was no discernable stratigraphic distinction between this level and the others. Also, there was no correlation between the high concentration of pottery and a high concentration of charcoal or shell in level 3. These characteristics suggest that Layer II probably consists of naturally (i.e. storm wave) redeposited sediments. It is also possible that the cultural material was derived from the original cultural deposit that was removed by grading, and that some of this cultural material, particularly the heavy pottery sherds, gravitated through the soft sand to lower levels by natural processes. This idea will be tested in the section dealing with pottery analysis; the sherds from level

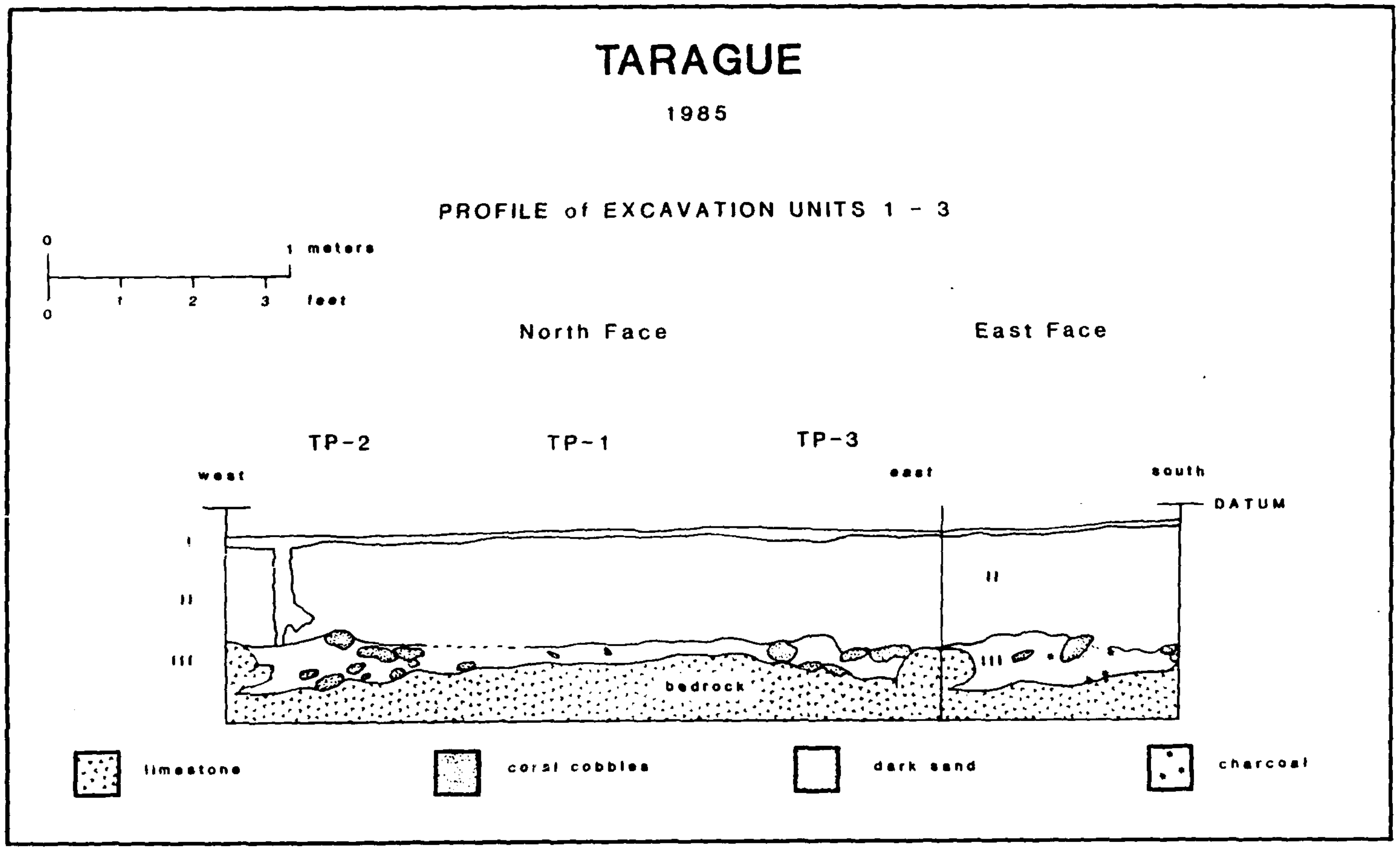


Figure 6. Profile of Excavation Units 1, 2, and 3.

3 should be typologically similar to those of the in situ cultural layer in Excavation Unit 4 if they were in fact originally derived from that layer. The boundary of Layer II with Layer III is abrupt and wavy.

Layer III, also composed of calcareous sand, was distinguished by its very light grey color. It was also found to be compacted (perhaps slightly cemented) upon excavation. There were also abundant rounded coral cobbles and several small boulders. Charcoal flecking greatly increases in density in this layer, though it is still quite sparse. There is a small area of darkened sand with a small amount of charcoal flecking in Excavation Unit 3. It is believed that this is probably not a feature, but a concentration of storm wave transported cultural sediments. This layer also shows a slight increase in the density of pottery, which also suggests that this layer may be incorporating a transported cultural deposit. The density of crab remains is much higher than for Layer II. The color of the sand is light grey. The abundance of rounded cobbles in this layer strongly suggests storm wave transport of sediments. Layer III is approximately 8 to 20 cm. thick and directly overlies eroded limestone bedrock. The surface of this bedrock is smooth but very irregular and uneven.

Table 2 lists material collected from the excavation units, including actual weights and concentration indices (i.e., density/cubic meter). The "row totals" on the right side of the table indicate actual weights of all collected material for each category. No basalt was found, and the three artifacts indicated for level 4 consist of fragments of probable cut and drilled pearl shell. Concentration indices for pottery, charcoal, shell, and crab are graphed by level in Figure 7. As can be seen in this figure, there is no clear correspondence between the values of any of graphs (e.g., pottery and charcoal do not show corresponding increases and decreases for the same levels, and the shell graph has no major peaks to go along with either the charcoal or pottery curves. This would seem to indicate that all the cultural material in Excavation Units 1, 2, and 3 is the product of secondary deposition, whether by infiltration from upper layers (now removed by grading) or storm wave transport.

Except for level 7, there was insufficient charcoal in any of the levels for a reliable radiocarbon date. The charcoal of level 7, which totalled 4.8 grams, was also considered unreliable because of its probable secondary deposition.

Excavation Unit 4

This excavation unit is located approximately 9 meters north-northeast of Excavation Unit 3, being slightly over 4

Table 2. List of materials recovered from Excavation Units 1, 2, and 3 with concentration indices.

Layer/Level	I/1		I/1		II/2		II/2		II/3		II/3		II/4		II/4		II/5		II	
Depth cm. b.d.	8-12		8-12		12-16		12-16		16-26		16-26		26-36		26-36		36-46		36-	
Vol./cu./m.	0.093		0.078		0.06		0.125		0.038		0.276		0.071		0.305		0.069		0.31	
screen size	1/8		1/4		1/8		1/4		1/8		1/4		1/8		1/4		1/8		1	
	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	
Shell	183.0	1,967.7	156.7	2,008.9	31.4	523.3	291.8	2,334.4	77.5	2,039.5	502.6	1,821.0	126.8	1,785.9	407.1	1,334.7	65.0	942.0	317.9	1,[illegible]
Charcoal	1.7	18.3	0.8	10.2	2.3	38.3	0.9	7.2	0.7	18.4	1.0	3.6	1.3	18.3	1.8	5.9	0.2	2.9	tr	
Fishbone	-	-	-	-	0.1	1.6	-	-	0.1	2.6	-	-	0.1	1.4	-	-	-	-	0.3	
Mam. bone	8.8	94.6	58.9	755.1	43.7	728.3	448.6	3,588.8	1.9	50.0	4.6	16.7	0.5	7.0	-	-	-	-	-	
Crab	0.7	7.5	0.4	5.1	0.7	11.6	1.5	12.0	0.9	23.7	2.3	8.3	1.7	23.9	7.0	22.9	0.8	11.6	1.4	
Pottery	27.8	298.9	36.5	467.9	-	-	129.9	1,039.2	258.8	6,810.5	456.3	1,653.2	25.3	356.3	224.2	735.0	-	-	108.4	3[illegible]
Basalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Artifacts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3*	-	-	-	-	
Metal	0.4	4.3	7.4	94.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Glass	-	-	0.7	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes: g = grams
ci = concentration index (grams per cubic meter)
tr = trace
* = number instead of weight

ıth concentration indices.

II/4 26-36 0.071 1/8		II/4 26-36 0.305 1/4		II/5 36-46 0.069 1/8		II/5 36-46 0.316 1/4		II/6 46-56 0.052 1/8		II/6 46-56 0.233 1/4		III/7 56-66 0.204 1/8		III/7 56-66 0.045 1/4		III/8 66-76 0.076 1/8		ROW TOTALS 2.041 cubic meters
g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	
126.8	1,785.9	407.1	1,334.7	65.0	942.0	317.9	1,006.0	54.0	1,038.4	380.8	1,634.3	252.5	1,257.7	32.0	711.1	81.9	1,077.6	2,961.0 grams
1.3	18.3	1.8	5.9	0.2	2.9	tr	-	0.2	3.8	tr	-	4.8	23.5	0.1	2.2	0.1	1.3	15.9 grams
0.1	1.4	-	-	-	-	0.3	0.9	-	-	-	-	-	-	-	-	-	-	0.6 grams
0.5	7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	567.0 grams
1.7	23.9	7.0	22.9	0.8	11.6	1.4	4.4	0.6	11.5	0.7	3.0	2.8	13.7	-	-	0.2	2.6	21.7 grams
25.3	356.3	224.2	735.0	-	-	108.4	343.0	36.4	700.0	5.2	22.3	181.8	891.1	2.7	60.0	-	-	1,493.3 grams
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	3*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3*
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8 grams
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7 grams

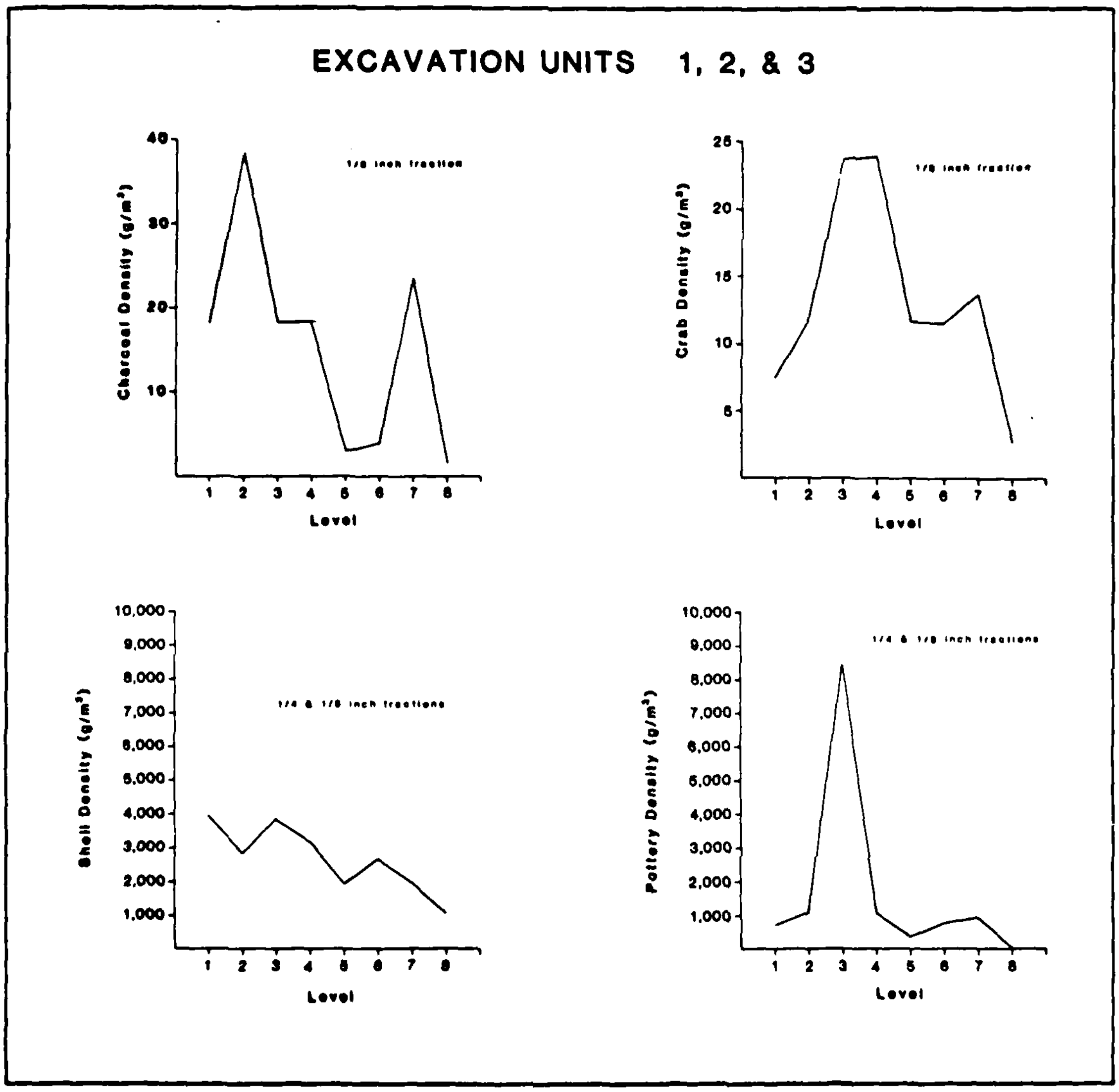


Figure 7. Graphs of midden densities, Excavation Units 1, 2, and 3.

meters beyond the edge of the grading in a presumably undisturbed area (see Fig. 5). The location is completely shaded by mature coconut and hibiscus trees (Photo 11). The ground surface of the entire area has numerous pottery sherds. The surface, where not covered by decaying vegetation, has a rich black soil. Understory vegetation was minimal (no grasses or bushes). As the profile of the plan view map indicates (Fig. 5), the ground surface slopes steeply 6 meters north of Excavation Unit 4. This appeared to be the result of bulldozing conducted some time ago (according to Ray [1980:28], this was done immediately prior to his field investigations in 1966-1968). Huge areas of soil had been gouged out in an irregular manner and coconut trees 20 to 30 ft. tall are now growing out of these deep depressions.

Excavation Unit 4 is a 1 x 1 meter square excavated to a maximum depth of 2.2 meters below the surface. Bedrock was never reached, though the depth and narrowness of the excavation unit prevented further digging. A total of 15 levels were excavated in 7 stratigraphic units. A profile of Excavation Unit 4 is presented in Figure 8, and Table 3 summarizes materials recovered from this unit. All sediments were screened in 1/8 inch mesh screen. The primary archaeological deposit is that of Layer III, which is a dark humic sand layer with plentiful charcoal, pottery, and artifacts (Photo 12). Below level 5 at 38-48 cm. b.d. only generally minute quantities of charcoal were found (though level 8 is an exception with 8.8 grams). Pottery becomes very sparse below level 7 at 58-68 cm. b.d. The stratigraphic layers may be briefly described as follows (samples with Munsell colors were examined in the laboratory):

I Dark Brown — Humus and decaying vegetation mixed with calcareous sand. Pottery and charcoal present. Abrupt and slightly wavy lower boundary.

II Very Pale Brown — Calcareous sand; course, medium, and fine grains; single grain wet/dry very friable, loose, non-coherent; homogenous; no charcoal or pottery. Probable storm wave deposit or 'dozing disturbance. Abrupt lower boundary, smooth to slightly wavy.

III Dark Grey — (5YR 4/1 d) Calcareous sand with abundant humic material and plentiful charcoal; coarse, medium, and fine grains; single grain wet/dry very friable, loose, non-coherent; rootlets extremely dense; coral pebbles numerous, 2-5 cm. average size range. Pottery plentiful. Lower boundary diffuse and slightly wavy.

IV Dark Grey — Calcareous sand; course, medium, and fine grains; homogeneous; single grain wet/dry very

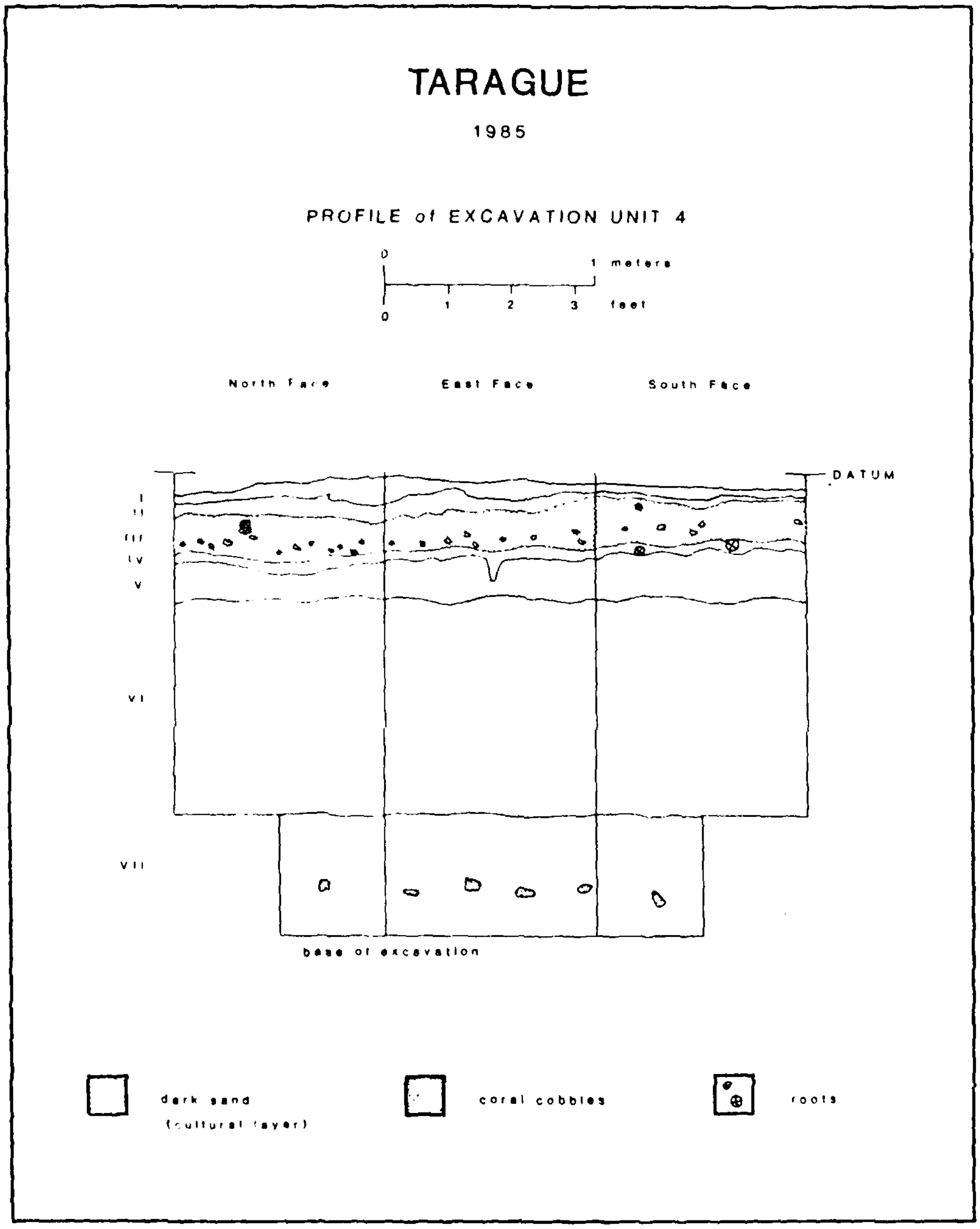


Figure 8. Profile of Excavation Unit 4.

Table 3. List of materials recovered from Excavation Unit 4 with concentration [illegible].

Layer Level	I 1		II-III 2		III 3		III 4		IV 5		V 6		[illegible]		[illegible]		[illegible]	
Depth cm. b.d.	[illegible]		11-20		[illegible]		[illegible]-38		38-48		48-58		[illegible]		[illegible]		78-91	
Vol. [illegible]	[illegible]		0.092		0.088		0.075		0.09		0.09		[illegible]		[illegible]		[illegible]	
Screen size	1/8		1/8		1/8		1/8		1/8		1/8		[illegible]		[illegible]		1/8	
	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci
Shell	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Charcoal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	81.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fishbone	[illegible]	[illegible]	4.8	[illegible]	[illegible]	[illegible]	[illegible]	90.6	[illegible]	38.8	0.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mam. bone	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.1	67.7	1.8	[illegible]	[illegible]		[illegible]	[illegible]	0.2	[illegible]
Crab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	74.4	9.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pottery	[illegible]	[illegible]	[illegible]	[illegible]	585.1	[illegible]	[illegible]	2,216.6	49.8	[illegible]	76.5	850.0	[illegible]	[illegible]	[illegible]	[illegible]	1.0	[illegible]
Basalt	-	-	-	-	3*	-	1*	-	1*	-	-	-	-		-	-	-	-
Artifacts	-	-	1*	-	2*	-	-	-	-	-	-	-				-	-	-
Metal	0.2	[illegible]	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
Glass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: g = grams
ci = concentration index (grams per cubic meter)
tr = trace
* = number instead of weight

ration indices.

	VI 7		VI 8		[illegible]		VI 10		VI 11		VI 12		VI 13		VII 14		VII 15		ROW TOTALS
[illegible]	56-68		66-78			[illegible]	91-107		107-125		125-145		145-163		163-192		[illegible]-220		
[illegible]	0.09		[illegible]			[illegible]	0.138		0.138		0.15		0.09		0.105		0.062		1.44 cubic meters
[illegible]	1/8		1/8			[illegible]	1/8		1/8		1/8		1/8		1/8		1/8		
[illegible]	g	ci	g	ci		[illegible]	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	
[illegible]	[illegible]	[illegible]	100.[illegible]	[illegible]	[illegible]	[illegible]	70.[illegible]	569.[illegible]	95.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,711.1	135.0	1,266.6	[illegible]	996.[illegible]	[illegible] grams
[illegible]	[illegible]	15.9	8.8	[illegible]	[illegible]	[illegible]	[illegible]	1.[illegible]	0.7	[illegible]	0.[illegible]	[illegible].0	[illegible]	6.6	0.1	0.9	[illegible]	3.[illegible]	14[illegible] grams
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].0	0.[illegible]	[illegible]	0.[illegible]	[illegible]	[illegible]	3.3	0.6	[illegible]	tr	-	34[illegible] grams
[illegible]	[illegible]	30.[illegible]	0.[illegible]	[illegible]		[illegible]	-	-	-	-	-	-	-	-	-	-	-	-	6[illegible] grams
[illegible]	6.[illegible]	93.[illegible]	2.2	[illegible]	[illegible]	[illegible]	[illegible].6	14.5	1.[illegible]	10.1	0.9	6.0	[illegible]	[illegible]	0.[illegible]	[illegible].8	[illegible]	14.[illegible]	44.[illegible] grams
[illegible]	50.7	896.[illegible]	4.6	[illegible]	[illegible]	[illegible]	tr	-	-	-	-	-	-	-	-	-	-	-	2,02[illegible] grams
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]
-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9 grams
-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-

friable, loose, non-coherent; probable illuviation zone with humic staining from layer III. Lower boundary diffuse and slightly wavy. Pottery and charcoal present in low quantities.

V Very Pale Brown (10YR 7/3 d) Calcareous sand; course, medium and fine grains; single grain wet/dry very friable, loose, non-coherent; homogeneous; no lenses or bedding planes observed; not bioturbated. Abrupt and smooth lower boundary. Pottery and charcoal present in low quantities.

VI White (10YR 8/2 d) Calcareous sand; course, medium, and fine grains; single grain wet/dry very friable, loose, non-coherent; homogeneous; no lenses or bedding planes observed. Small amount of pottery present only in upper part of layer. Lower boundary abrupt and smooth. Except for level 8, charcoal present in only minute quantities.

VII Light Grey (10YR 7/2 d) Calcareous sand; course, medium, and fine grains; single grain wet/dry very friable, loose, non-coherent; homogeneous, slightly compacted or cemented upon excavation (however, cementation not evident in laboratory sample). A lens of rounded coral cobbles occures at 2.0 meters b.d. A minute amount of charcoal is present; no pottery. Grey color does not appear to be the result of gleying. Lower boundary of layer not reached in excavation.

In comparing the soil descriptions of Excavation Unit 4 with those of Excavation Units 1-3, there is little doubt but that Layers VI and VII of Unit 4 correlate with Layers II and III of Units 1-3. Sediment texture, color, and structure appear to be identical between the respective layers. In retrospect, it is possible that the lower part Layer V of Unit 4 is also represented in the stratigraphy of Units 1-3, though it was not recogized as a separate stratigraphic unit due to its very diffuse boundary and small but very gradual color change (from a very pale tan to white).

Figure 9 shows graphs of the density distributions of pottery, charcoal, shell, and crab in all the levels of Excavation Unit 4. These graphs were prepared using the concentration indices presented in Table 3. As may be seen, there is a close correspondence between the pottery and charcoal graphs, indicating that almost all this material is found in levels 1 through 4 (Layers I, II, and III). After level 4 there

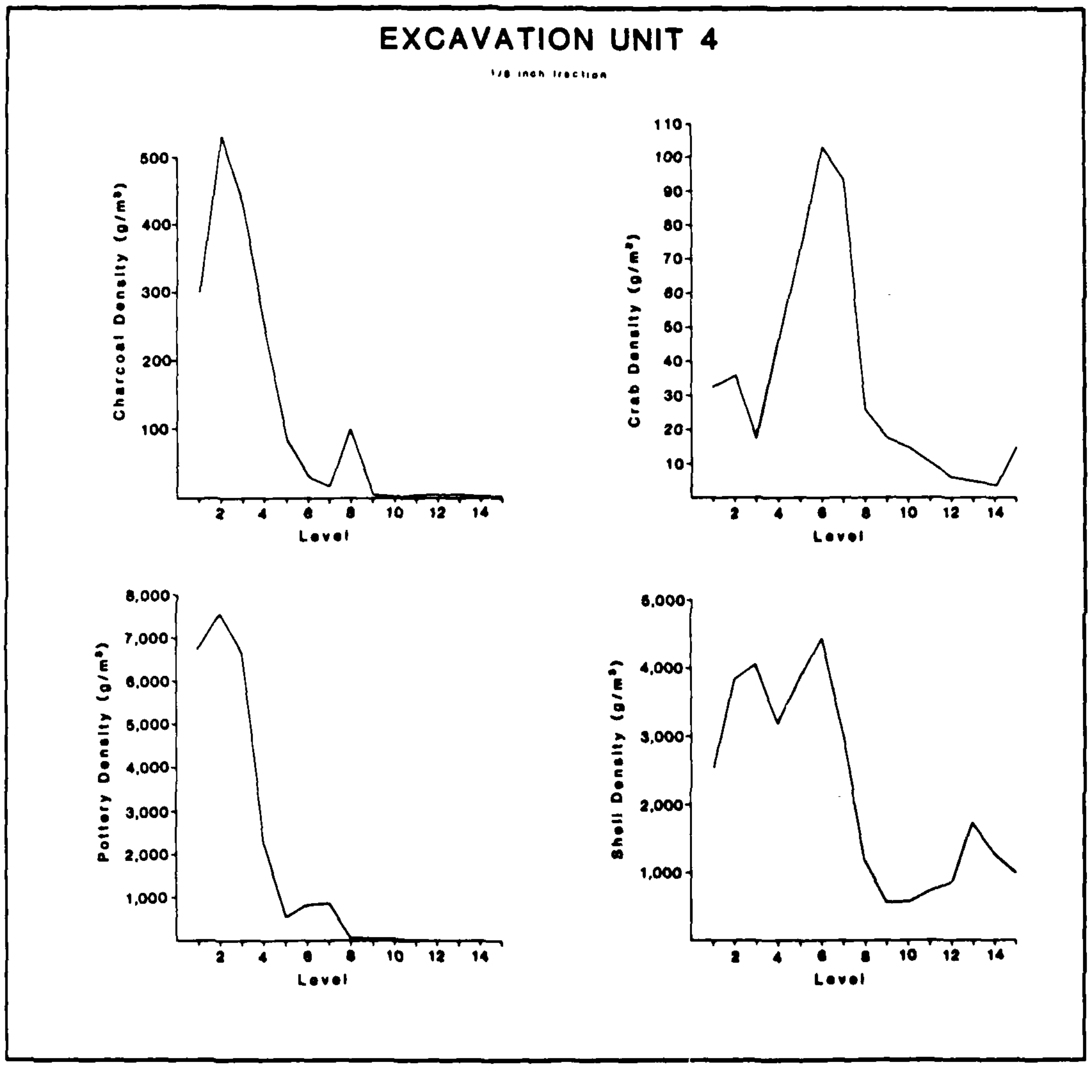


Figure 9. Graphs of midden densities, Excavation Unit 4.

is an abrupt decrease. With respect to the crab remains, the lack of correpondence of this graph to those of the pottery and charcoal suggest that they are probably non-cultural. The shell remains, on the other hand, indicate a somewhat different situation. The graph shows a very high density for the primary cultural levels (1-4), and this high density continues through to level 7, whereupon it falls off dramatically. Thus, except for the first four levels, the shell graph is quite similar to the crab graph. One possible explanation is that the initial high density of shell indicated by the graph is the result of the accumulation of shell in the primary archaeological levels due to collecting and eating of shellfish by the human occupants. Upon discard, many of the remains were carried to greater depths in the sand deposits by burrowing crabs, which is why the crab remains are also high in levels 5 through 7.

One of the most interesting inferences to be derived from the graphs of Figure 9 concerns the abrupt decline in pottery and charcoal densities, followed by a very gradual further decrease at extremely low densities. This pattern is highly suggestive of the infiltration of this material from the higher levels through natural processes. The only aberration in the graphical analysis concerns the charcoal in level 8. The reason for this slight increase is uncertain, though burrowing crabs or large roots (of which there were several) could be responsible. Since there was no observed charcoal lens or stratigraphic discontinuity in level 8, it is unlikely that the charcoal represents cultural activity associated with this level, which is within a completely homogeneous stratigraphic unit.

The significance of documenting a natural process (or processes) concerning the infiltration of cultural materials from higher levels to lower levels in the sand sediments of Tarague have considerable bearing on the interpretation of the South Profile data of Kurashina and Clayshulte (1983a and 1983b) and Moore (1983). If infiltration can be shown to be occurring in the excavation units of the present project, then it is at least possible that the low pottery counts in the basal stratigraphic units of the South Profile may be due to infiltration from upper layers. And this would mean that the early dates and pottery have little archaeological significance unless a more secure means of documenting the association of one with the other can be provided.

At this point in the present discussion, of course, the case for infiltration has yet to be proven or even substantially warranted as a potential problem for archaeological interpretation at Tarague. But one of the ways this can be done is through an analysis of the pottery. If it can be shown that the pottery found below level 4 is essentially the same type as that found in level 4 and above, then the argument for

infiltration will be substantially strengthened. On the other hand, if the pottery from the lower levels is largely different, then it can be assumed that this pottery represents an early time period and its presence in the lower levels has nothing to do with infiltration. Just such an analysis will be one of the goals of the pottery analysis section of this report, which will be presented later.

Other items recovered from Excavation Unit 4 include 5 small pieces of basalt (levels 3, 4, and 5), 2 slingstones (1 basalt and the other coral from levels 2 and 3, respectively), 1 Tridacna lip adze fragment from level 3, and 2 tiny pieces of ferrous metal from level 1.

The charcoal collected from Excavation Unit 4 consists almost entirely of burnt shell fragments, probably from coconuts. A sample from level 4 produced a radiocarbon date of 340 $\pm$ 60 B.P., which may be calendar corrected to A.D. 1420-1650 (see Table 19, Chapter 4). As level 4 represents the basal part of the Layer III cultural deposit, this date may be considered to represent the approximate initial period of occupation. As may be seen, the date includes both the very late prehistoric and very early historic periods. But because there are no historic remains in Layer III, it appears likely that the deposit must be prehistoric, or at least date to the time before regular Spanish contact with Guam (i.e. prior to about 1568, when galleon trade was initiated and Guam became a provisioning port).

Excavation Unit 5

This excavation unit is a 1 x 1 meter square placed adjacent to the south face of the burn pit at the east end of Tarague (see map, Fig. 10, and Photo 13). Elevation above sea level at this location is approximately 4 meters (13 ft).

Although excavation of a test pit was not specifically called for in the scope of work for this project, it was believed to be a necessary task in order to properly examine the contents of the burn pit profile, which was a project requirement. Mr. Charles Streck, project monitor, concurred with this assessment.

The north edge of the excavation unit was placed 1 meter from the burn pit edge to avoid the possibility of the profile face collapsing during excavation. With respect to the burn pit profile, the excavation unit was located between the 6.3 and 7.3 meter designations on the profile (see Fig. 13). The area had very sparse vegetation, and the ground surface in and around the excavation unit only a sparse cover of low grasses (Photo 13). The excavation of Unit 5 was conducted after the south face of

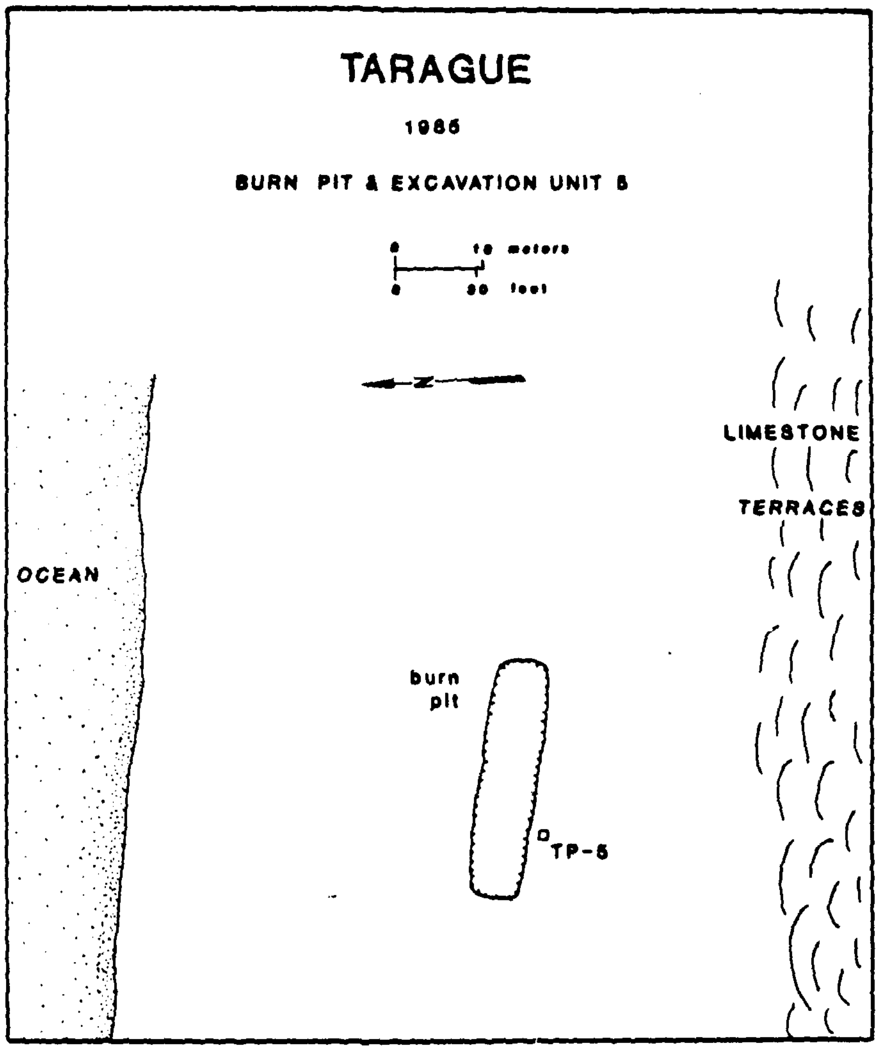


Figure 10. Location of Excavation Unit 5 and Burn Pit.

the burn pit had been profiled and the stratigraphic units identified.

The excavation procedure for Unit 5 was virtually identical to that of Excavation Unit 4. All sediments were screened in 1/8 inch mesh screen. There were a total of 10 levels and 10 stratigraphic layers (not coterminus). Excavation reached a maximum depth of 193 cm. below datum. Although bedrock was not reached, the lack of cultural materials in the lower levels made it appear unlikely that there would be additional cultural layers. A profile of Excavation Unit 5 is presented in Figure 11. Table 4 lists all materials recovered from the excavation. A graphical representation of the densities of pottery, charcoal, shell, and crab is given by level in Figure 12.

It is possible to distinguish 3 separate stratigraphic units that are the primary archaeological occupation layers in Excavation Unit 5. These are Layers III, V, and VII, which are all separated from one another by white beach sand deposits containing limited cultural material (see Photos 14 and 15). The occupation layers are all of a dark color, containing generally abundant pottery and charcoal. Only Layer VII, which was represented in Excavation Unit 5 by a lens in the northwest quadrant, failed to produce abundant cultural remains, probably because of its small size. Apparently Excavation Unit 5 was placed at edge of this occupation, as the burn pit profile (see Fig. 13) shows Layer VII to cover a fairly broad area.

Near the base of Excavation Unit 5 is a grey sand layer (VIII) containing moderately abundant charcoal but no pottery or other obvious cultural material. As such, it is believed that this layer may have been a former A horizon soil in which humic matter was responsible for the grey staining; the layer does not appear to be gleyed. The charcoal probably resulted from nearby cultural activities (e.g., burning for gardening), or less likely, a natural fire. Present evidence provides no indication that Layer VIII was an occupation layer or that it contains archaeological deposits other than charcoal.

All sediments from Excavation Unit 5 were composed of calcareous sand having course, medium, and fine grains; single grain wet/dry very friable, loose, and non-coherent. Color, boundaries, and other distinguishing features for each layer are as follows:

I White (10YR 8/1 d); some darker lensing; abrupt and smooth lower boundary. Layer appears to have been a depression recently filled by transported sand.

II Light Grey (10YR 6/1 d); abrupt and smooth lower boundary. Probable post-grading ersosional

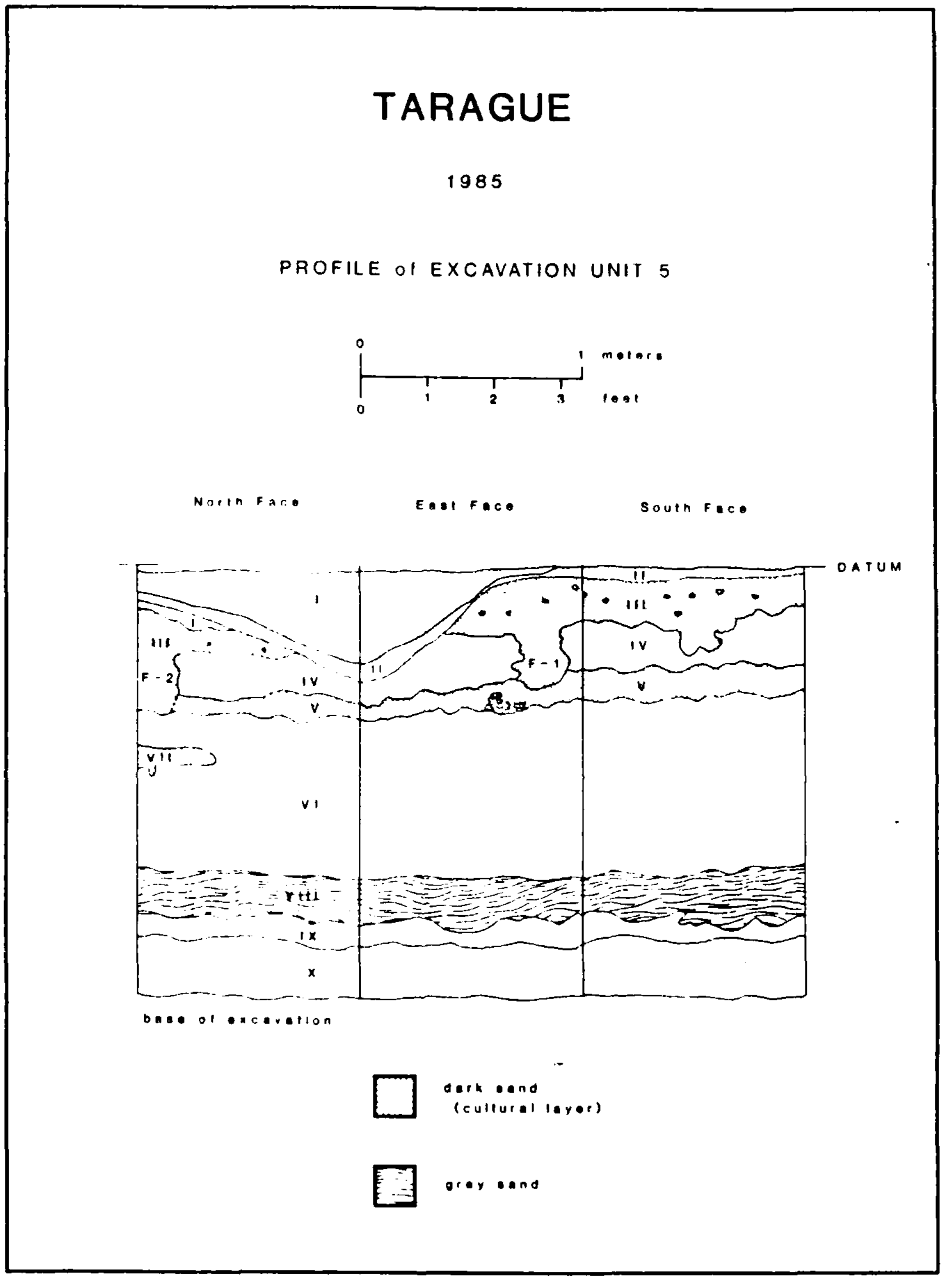


Figure 11. Profile of Excavation Unit 5.

Table 4. List of materials recovered from Excavation Unit 5, with concentration indices.

Layer Level	1-II/1		II/2a		III/2b		III/3		F-1 III/4		IV/4		V/5		VI/6		VI/7		VII/7	
Depth cm. b.d.	4-13		13-33		13-27		27-35		35-49		35-49		49-63		63-83		83-104		86-96	
Vol. cu. m.	0.165		0.045		0.09		0.09		0.009		0.154		0.135		0.18		0.205		0.023	
Screen size	1/8		1/8		1/8		1/8		1/8		1/8		1/8		1/8		1/8		1/8	
	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci
Shell	310.7	1,883.0	166.5	3,700.0	198.5	2,205.5	218.8	2,431.1	13.6	1,511.1	145.0	941.5	448.5	3,322.2	154.0	855.5	73.4	358.0	54.2	2,356.5
Charcoal	5.8	35.1	11.5	255.5	60.6	673.3	23.7	263.3	1.9	211.1	15.7	101.9	22.9	169.6	6.7	37.2	1.0	4.9	0.7	30.4
Fishbone	0.9	5.4	0.8	17.7	4.5	50.0	1.7	18.8	tr	-	0.3	1.9	1.7	12.6	0.2	1.1	tr	-	tr	-
Mam. bone	1.6	9.7	0.8	17.7	8.8	97.7	6.4	71.1	-	-	0.6	3.9	4.3	31.8	0.7	3.8	-	-	-	-
Crab	1.6	9.7	0.5	11.1	2.3	25.5	6.4	71.1	tr	-	8.1	52.6	2.7	20.0	2.3	12.7	0.4	1.9	1.3	56.5
Pottery	20.3	123.0	53.8	1,195.5	143.8	1,597.7	246.7	2,763.3	12.7	1,411.1	86.5	561.7	686.3	5,083.7	92.3	512.7	3.8	18.5	-	-
Basalt	-	-	1*	-	1*	-	1*	-	-	-	-	-	-	-	-	-	-	-	-	-
Artifacts	2*	-	-	-	1*	-	-	-	-	-	-	-	-	-	1(?)*	-	-	-	-	-
Metal	17.6	106.6	1.3	28.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glass	-	-	1.0	22.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: g = grams
ci = concentration index (grams per cubic meter)
tr = trace
* = number instead of weight

[illegible]centration indices.

IV/4		V/5		VI/6		[illegible]		VII/7		F-3 V/6,7,8		VI/8		VIII/9		IX-X/10		ROW TOTALS
[illegible]-49		49-63		6[illegible]-8[illegible]		[illegible]		86-96		83-124		104-138		138-165		165-193		
[illegible]		0.135		0.18		[illegible]		0.023		0.022		0.33		0.255		0.24		1.646 cubic meters
[illegible]		1/8		1/8		[illegible]		1/8		1/8		1/8		1/8		1/8		
g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	g	ci	
[illegible]	941.5	448.5	3,322.2	154.0	[illegible]	[illegible]	358.0	54.2	2,356.5	14.4	654.5	63.8	193.3	61.2	240.0	146.5	616.7	[illegible] grams
[illegible]	101.9	22.9	169.6	6.7	[illegible]	[illegible]	[illegible]	0.7	30.4	2.5	113.6	0.4	[illegible]	43.0	168.6	tr	-	196.[illegible] grams
[illegible]	1.9	1.7	12.6	0.2	1.1	tr	-	tr	-	-	-	0.1	0.3	-	-	-	-	10.2 grams
[illegible]	3.9	4.3	31.8	0.7	3.8	-	-	-	-	-	-	0.3	0.9	-	-	-	-	23.5 grams
[illegible]	52.6	2.7	20.0	2.3	12.7	0.4	[illegible]	1.3	56.5	-	-	3.8	11.5	0.8	3.1	5.7	23.7	35.9 grams
[illegible]	561.7	686.3	5,083.7	92.3	[illegible]	[illegible]	16.5	-	-	70.3	3,195.4	-	-	-	-	-	-	[illegible],416.5 grams
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3*
-	-	-	-	1[illegible]*	-	-	-	-	-	-	-	-	-	-	-	-	-	4*
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.9 grams
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0 grams

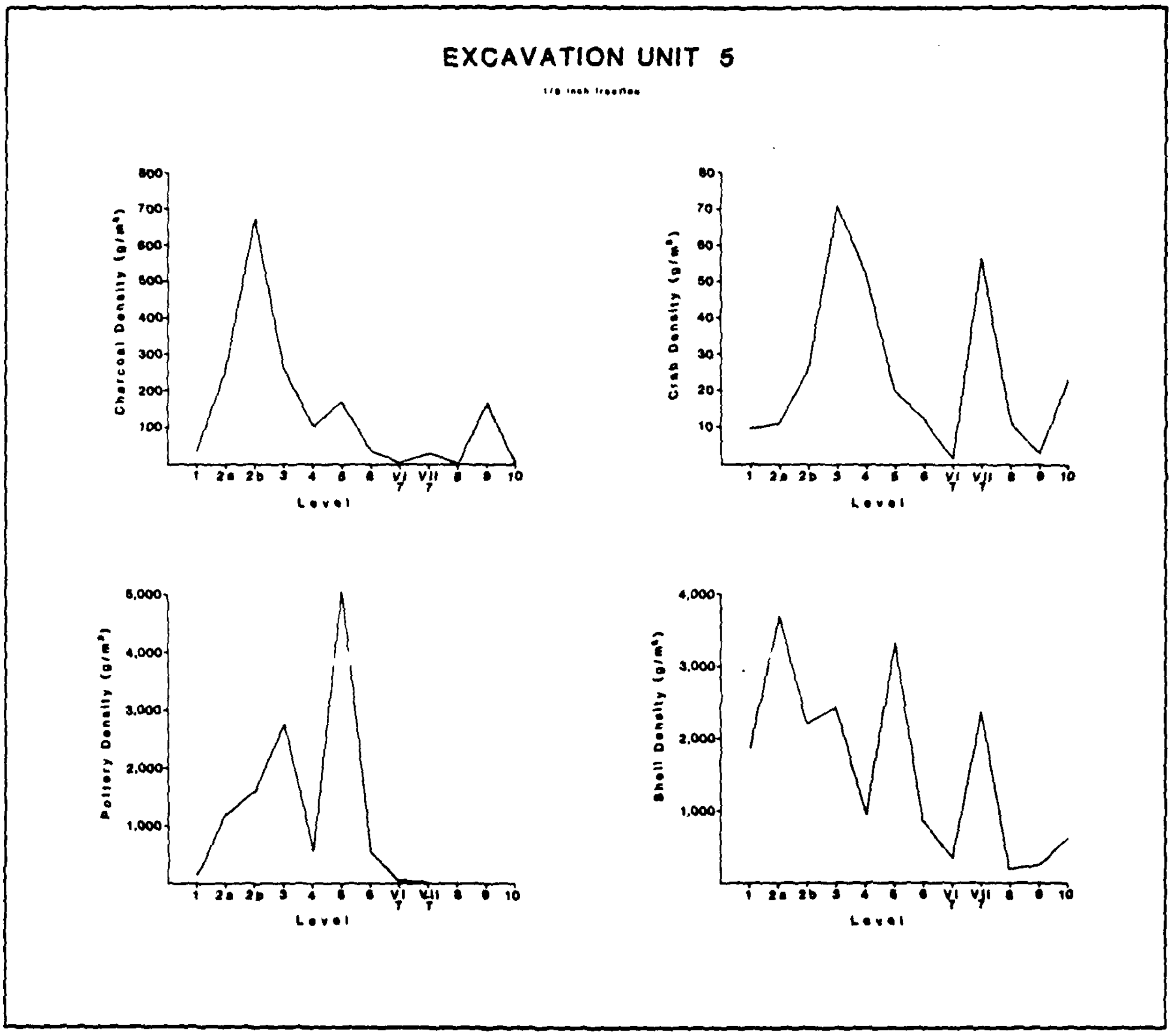


Figure 12. Graphs of midden densities, Excavation Unit 5.

deposition. Metal and several bullets present in sediment matrix.

III Very Dark Grey (10YR 3/1 d); charcoal common; coral pebbles 2-5 cm. numerous; abrupt and irregular lower boundary. This is a cultural occupation layer.

IV Light Brownish Grey (10YR 6/2 d) some grey and light brown mottles present; abrupt and wavy lower boundary. Slightly grey color probably represents illuviation from layer III.

V Dark Grey (10YR 4/1 d) charcoal common and coral pebbles 2-5 cm. numerous; abrupt and wavy lower boundary. This is a cultural occupation layer.

VI White (10YR 8/2 d); homogeneous layer; abrupt and smooth lower boundary.

VII Greyish Brown (10YR 5/2 d); charcoal common; abrupt and wavy lower and upper boundaries. This is a cultural occupation layer. It was present in only the southwest quadrant of the excavation unit.

VIII Light Brownish Grey (10YR 6/2 d); abrupt and wavy lower boundary. Lower part of layer appears to have more abundant charcoal and color shifts slightly to 10YR 6/3 (pale brown).

IX White (10YR 8/2 d); abrupt and wavy lower boundary.

X Light Grey (10YR 7/2 d); lower boundary not reached in excavation.

Three probable features were identified during excavation. Features 1 and 2 are visible in the profile of Excavation Unit 5 (Fig. 11). Both of these features, which appear to be pits, are associated with Layer III. The sediment contained in both features was indistinguishable from the Layer III sediment matrix. The contents of Feature 1 were excavated, screened, and bagged separately (see Table 4), and laboratory analysis confirmed field observations that the sediment matrix was the same as that of Layer III.

The third feature, F-3, was that of an apparent post-hole, which emanated from Layer V and extended downward from 83 cm. b.d. to a maximum depth of 124 cm. b.d. It was circular in cross section, measuring approximately 21 cm. in diameter for its

entire length. The sediment matrix inside the post-hole was the same as that found in Layer V. The sediment contents were removed in three separate levels, and screened and bagged separately (see Table 4, which combines the contents of the three levels).

A number of artifacts (including one "possible" specimen from level 6) were recovered from Excavation Unit 5. These include 2 bullets and various metal fragments from level 1, a shell bead from level 2 (Layer III), a piece of clear glass and metal fragments from level 2 (Layer II), 3 pieces of basalt from levels 2 (Layers II and III) and 3, and a possible limestone grinding fragment from level 6. In addition, there were a total of 1,418.5 grams of pottery sherds.

With respect to characoal, a total of 196.4 grams were collected from Excavation Unit 5. As might be expected, the greatest amount was recovered from the two thickest occupation layers--III and V. Layer VII, another occupation layer, yielded relatively little charcoal, perhaps because of the small area it occupied in the excavation unit. As previously mentioned, Layer VIII also contained a substantial amount of charcoal, though this is probably not an occupation layer. Radiocarbon dates were processed from the charcoal of Layers III, V, and VIII, providing corrected ages of A.D. 1400-1515, A.D. 1260-1405, and A.D. 625-895, respectively (see Table 19, Chapter 4). These dates are clearly in excellent stratigraphic order and indicate that the entire archaeological sequence for this part of Tarague is prehistoric.

A graphical representation of charcoal, shell, crab, and pottery densities for Excavation Unit 5 is presented in Figure 12 (the features are not included in this analysis). As may be seen, pottery densities are highest for the Layers III and V (levels 2b, 3, and 5), though pottery is curiously absent in the Layer VII cultural layer. The latter may be due to the small size of this layer in the excavation unit. Charcoal densities also show clear peaks for the upper two cultural layers, but a peak is less apparent for Layer VII, where only a small amount of charcoal was present. Level 9 (Layer VIII) has approximately the same density of charcoal as level 5, though the former was probably not an occupation layer as previously noted. This is also suggested by the graph for shell, which indicates an extremely low density for level 9, while the three cultural layers show high peaks with intervening troughs for the non-occupation layers that separate them. The graph for crab shows the highest densities in levels 3 and Layer VII of level 7. The density is also fairly high for level 5, though there is no peak. The meaning of this curve is not clear, though part of problem may have to do with the burrowing nature of crabs. They apparently have the strongest affinity for the cultural layers,

but are also found in moderately high densities in the immediately underlying levels, which seems to indicate burrowing. The crab shells are probably too light to be affected by infiltration processes.

Burn Pit Profile

The burn pit, located at the east end of Tarague (same location as Excavation Unit 5), is used for the burning and disposal of ordnance and explosives. It is approximately 40 meters from the shoreline and 4 meters above sea level (see Fig. 10, Photos 16-20). The general area has been used for ordnance disposal since 1961. The present pit was dug about 2 years ago (personal communication, Eduardo Garcia, Environmental Section, Andersen Air Force Base). The area between the ocean and lower limestone terraces is kept clear of vegetation through regular cutting. Surface sediment is entirely beach sand. There are no coconut trees and strand vegetation is largely absent. The beach abruptly terminates into limestone cliffs approximately 50 to 60 meters east of the burn pit. The reef also terminates at this point.

The burn pit was excavated by a bulldozer. It measures 27 meters in length (88.6 ft.). The width measures 5.1 meters (16.7 ft.) at both ends, expanding to 7 meters (23 ft.) in the center where slumping of the sides has obviously occurred. The maximum depth of the pit is approximately 2 meters (6.5 ft.), though the pit would have been somewhat deeper prior to slumping. Both ends of the pit slope upward.

Prior to beginning work on the profile, archaeological deposits were obvious in the south face of the pit. The north face, in contrast, did not appear to have any evidence of archaeological deposits. This observation was confirmed upon cleaning a small section of the north face. As a result, no further attention was given to this side of the pit.

The project's scope of work called for cleaning the pit's side walls, noting artifact locations, and recording contents and stratigraphy. As previously mentioned, work at Excavation Unit 5 was conducted in order to fulfill the requirement of recording contents and noting artifact locations due to the doubtful feasibility of securing adequate information directly from the profile face. As such, the following discussion will be primarily concerned with describing the profile in terms of its stratigraphy and features.

In cleaning the south face a primary concern was to destroy as little of the in-tact archaeological deposit as possible.

Since there had been a fair amount of slumping in the central area, it would have been necessary to scrape away large amounts of the archaeological deposit in order to achieve a vertical face. To avoid this it was therefore necessary to "step" the profile face in the central area. Unfortunately, the stepping resulted in some degree of distortion, as the archaeological layers appeared to be sloping downward (in accordance with the natural slope of the land). Thus, the central deposits in the profile (Layers III, IV, and V between 5 and 8.5 meters) probably appear somewhat thicker than they really are. For interpretive purposes, however, this distortion is considered to be a relatively inconsequential problem. though it should be kept in mind when comparing the stratigraphy of the burn pit with Excavation Unit 5.

The profile of the burn pit's south face is presented in Figure 13. The profile begins at the west end of the pit and continues for 16 meters. Additional profiling for the remainder of the south face (total length 27 meters) was not undertaken due to 1) repetition of the stratigraphic sequence, 2) the need to remove a large amount of soil from the badly slumped central area, and 3) the complications resulting from the use of multiple steps in the profile face.

Because the stratigraphic sequence of the profile is essentially the same as found in Excavation Unit 5, formal descriptions of the layers will not be repeated here. The only exceptions are several discontinuous sand lenses in the upper part of the profile. These are non-cultural white and pale tan sediments that clearly do not represent major stratigraphic events. Of particular interest, however, are the horizontal distributions of the cultural layers (III, V, and VII) and the presence of features.

With respect to the horizontal distribution of the cultural deposits, Layers III and V appear to terminate near the west end of the profile, while Layer VII apparently continues beyond the western edge of the profile. Layer VII, however, continues eastward only until the 5 meter point, whereupon it becomes a thin lens for several more meters. It apparently picks up again at the 13.5 meter point, where there is a clearly defined post hole pit (Feature 1) with the remains of the former wooden post in the center (dark organic deposit). Layer VII continues eastward as a relatively thick stratigraphic unit. The other cultural layers also continue to the east, occupying the entire length of the profile face except the extreme west end.

Besides the Layer VII post hole pit, three other pit features were identified in the profile. These all occur in Layer V. Feature 2 is very similar to Feature 1 in that it has a well defined center post stain. Feature 3 contains a number of

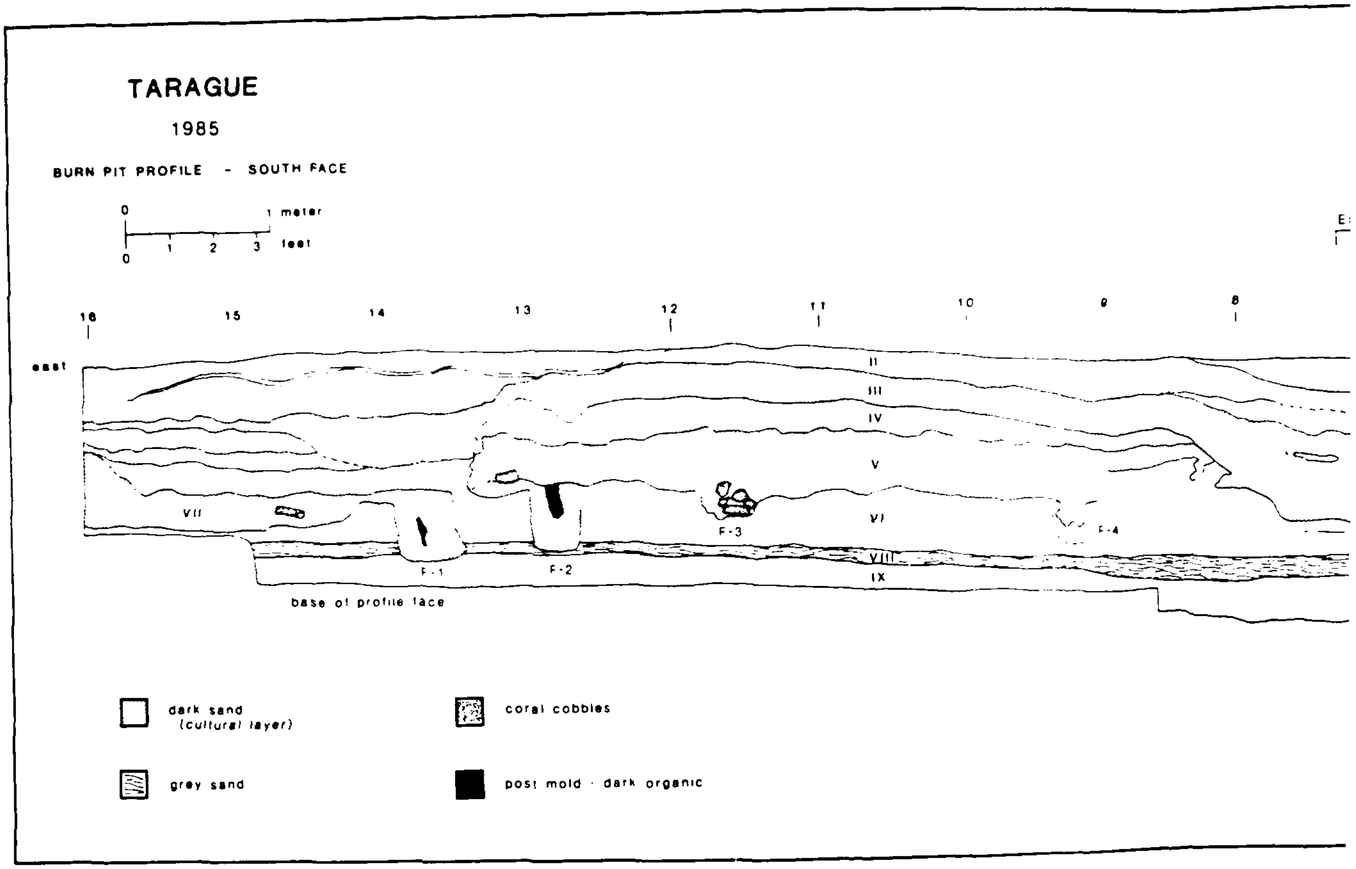
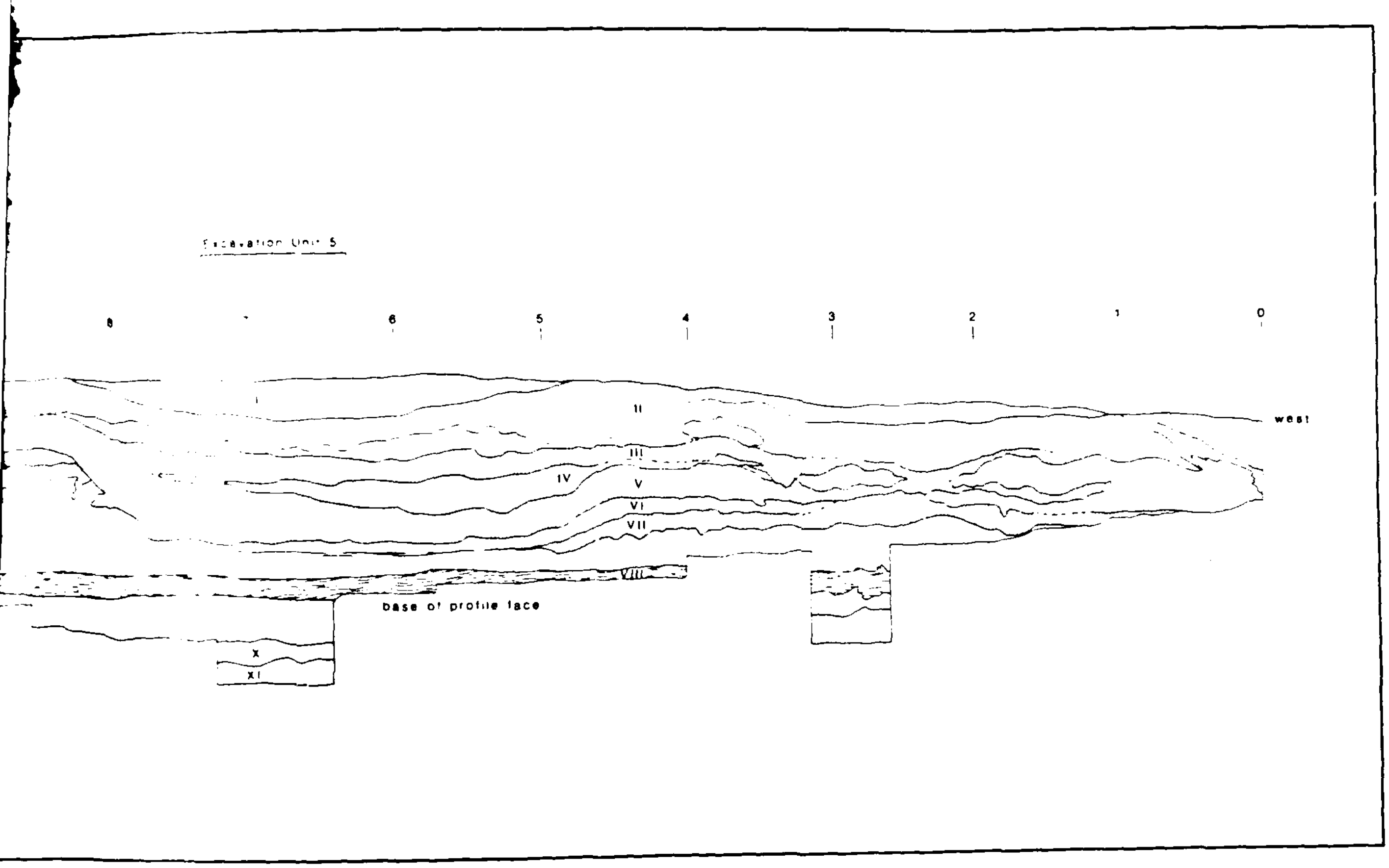


Figure 13. Profile of burn pit, south face.



Excavation Unit 5
8
6
5
4
3
2
1
0
I
II
west
III
IV
V
VI
VII
VIII
base of profile face
X
XI

coral cobbles. It is also believed to be a post hole pit, with the cobbles being used to stabilize the post that was probably once present. Feature 4 is also a pit feature, though its function is uncertain.

Other possible pit features include what appear to be large disturbances in Layers III and V at the 7 to 8 meter point and 13.5 to 14.5 meter point. While pits could not be defined due to very similar color and textural qualities of the sediment in the two layers, there are obviously intrusions from the upper cultural layer into the lower cultural layer.

Layer VIII was a virtually homogeneous grey sand layer. No charcoal flecking could be obverved in the profile. Unlike the boundaries of this layer in Excavation Unit 5, Layer VIII's lower boundary in the profile tends to be mostly smooth except for a section on the west end.

CHAPTER 4

DATA ANALYSIS

This section of the report will provide an analysis of the data recovered from field investigations at Tarague. Topics will include pottery, non-ceramic artifacts, shell midden, mammal and fish bone, skeletal analysis of burial remains, and chronology.

The discussion of chronology will be presented at the end of this chapter as the other topics (especially pottery) provide important insights on this subject.

Pottery

The pottery data will be presented separately for each of the excavation units or series (i.e., Excavation Units 1, 2, and 3; Excavation Unit 4; Excavation Unit 5). Analysis will be primarily oriented toward examination of the attributes of temper, thickness, surface decoration, rim form, and vessel form. Comparison of this data to that presented by Moore (1983) for the South Profile and Grid Squares will be of particular concern. Discussion of pottery attributes will be preceded by introductory remarks concerning the nature of the sample.

Excavation Units 1, 2, and 3

A total of 202 pottery sherds were recovered from Excavation Units 1, 2, and 3. These are listed by level in Table 5, where rims, decorated body sherds, and temper types are also indicated. Sherd density for these excavation units amounted to 98.9 sherds per cubic meter. This is almost exactly twice the density of the South Profile excavations (49.3 sherds/m^3).

For temper analysis, one edge of each sherd was scraped with a knife to expose a clean and freshly smoothed surface. This surface was then examined with either a magnifying glass or 10x hand lens. Often it was not possible to observe any temper, and such sherds were placed in the "no temper" category. This was an unexpected result as all of Moore's (1983) sherds apparently contained temper. Other sherds were classified as VST (volcanic sand temper) if black or greenish-grey inclusions were apparent in the paste, CST (calcareous sand temper) if white grains were observed, or MST (mixed sand temper) if both VST and CST grains were observed.

Occasionally, VST temper amounted to only several visible grains despite repeated scraping of the surface. This suggests that the volcanic sand grains may not be temper at all in these sherds, but rather natural inclusions in the clay paste. In

Table 5. Pottery recovered from Excavation Units 1, 2, and 3.

Level	Total Sherds	Rims*	Decorated Body Sherds*	Body sherds: No Temper	VST	MST	CST
1	27	1c	-	6	5	2	13
2	19	-	-	-	1	-	15
3	76	5c 1m	-	11	1	-	58
4	38	-	1n	1	-	1	35
5	21	1c	-	-	-	-	20
6	8	-	-	-	-	-	8
7	13	3c	-	1	-	-	9
8	-	-	-	-	-	-	-
TOTALS	202	8	1	22	7	3	161

* n = no temper   v = VST
m = MST   c = CST

order to be consistent with Moore's (1983) analysis, such sherds were nevertheless classified as VST.

A similar problem arose with some CST sherds; while CST was obvious in the majority of sherds, a few had very low densities of white grains. With such low densities, it is unlikely that the calcareous sand grains could function as temper in the pottery manufacture process, suggesting the likelihood that these may also be natural inclusions in the paste. As with the low density VST sherds, such sherds were classified as CST in order to be consistent with Moore's (1983) analysis.

Most of the MST sherds also appeared to have moderately to low densities of CST and even lower densities of VST. It is believed the latter may represent natural inclusions, though for the sake of consistency these sherds were classified as MST.

In order to reduce uncertainties in temper analyses, it is strongly urged that in the future a large sample (>100) of sherds be thin-sectioned and examined microscopically. Temper types, variability in densities, and other characteristics of the paste matrix can then be systematically described. It would then be possible to establish procedures as to how to determine VST, CST, MST, and no temper in sherds, which then could be uniformly applied by anyone undertaking temper analysis.

Another characteristic of the sherds examined in the present analysis is the tendency for non-CST sherds to be much harder than CST sherds, which generally would crumble easily.

A possible source of bias in the various frequency distributions of the present analysis concerns the generally small sample of sherds. There is also the associated problem that a sizable number of sherds appear to be from the same vessel (perhaps 10%, though this is only an impression). Thus, the frequency distributions reported for the present analysis should be viewed more as approximations rather than firmly established figures.

Results of the temper analysis are presented in Table 6. As may be seen, level 1 has the lowest percentage of CST sherds with 52%. Level 2 contains 79%, and levels 4 through 7 over 90%. These values roughly conform to the values beginning with level 9 of the Grid Squares (see Fig. 2), analyzed by Moore (1983:81). The main exception is that in the Grid Squares the percentage of CST sherds falls to about 50% rather than climbing to 90% and 100%. The VST figures in Table 6 also conform to the Grid Squares' figures beginning with level 9, showing low percentages in levels 1 and 2 in Excavation Units 1, 2, and 3, and then declining to nothing. The MST and "no temper" values show no correspondence to what was found in the Grid Squares.

With respect to the analysis of sherd thickness, data from Excavation Units 1, 2, and 3 are presented graphically in Figure 14 for only Layer II (levels 2-6). The other layers had insufficient sample sizes. Table 7 presents the thickness data by temper type for all measurable body sherds recovered from the excavation units, along with averages and standard deviations. In conformity to the analysis by Moore (1983:97), the thickness data is graphically arranged by 2 millimeter intervals, beginning with 3.9-5.9 (the graph shows only the high value for each interval). Values higher than 21.9 are lumped together (there are 6 sherds in this category, ranging in thickness up to 35 mm).

As may be seen, the thickness graph (Fig. 14) is prominently bimodal with the end point trailing upward (the latter is probably only a artifact resulting from lumping together all the sherds exceeding 21.9 mm). As Moore (1983:97) provides a

Table 6. Percentage of pottery temper types from Excavation Units 1, 2, and 3.

Level	No Temper %	VST %	MST %	CST %
1	22	19	7	52
2	16	5	0	79
3	14	1	1	83
4	5	0	3	92
5	0	0	0	100
6	0	0	0	100
7	8	0	0	92

thickness graph only for the South Profile sherds, comparison with the Fig. 14 graph is not as precise as it would have been if the Grid Squares data had been used (this is because of the small sample of sherds recovered from the South Profile and the fact that Layer I was excavated as a single unit). Nevertheless, the Fig. 14 graph shows relatively close correspondence to the South Profile curve for Layer V, which is also clearly bimodal. The first peak on Moore's curve is at 23% for the 7.9 mm interval, which is exactly the same for the Figure 15 curve. The second peak of Moore's curve is at 18% for the 15.9 mm interval, which corresponds to 16% at the 17.9 mm interval on the Figure 14 curve.

The temper and thickness data, when taken together, clearly are inconsistent with one another in terms of Moore's findings. The temper data from the Excavation Units corresponds with the basal Layer I and Layer II of the Grid Squares, while the thickness data is most consistent with the Layer V graph for the South Profile sherds. At this time it is not possible to reconcile this difference, except to say that the temper data are probably more reliable. In an earlier discussion of Moore's pottery analysis, it was indicated that the basal level of Layer I in the Grid Squares is estimated to have a date of about A.D.

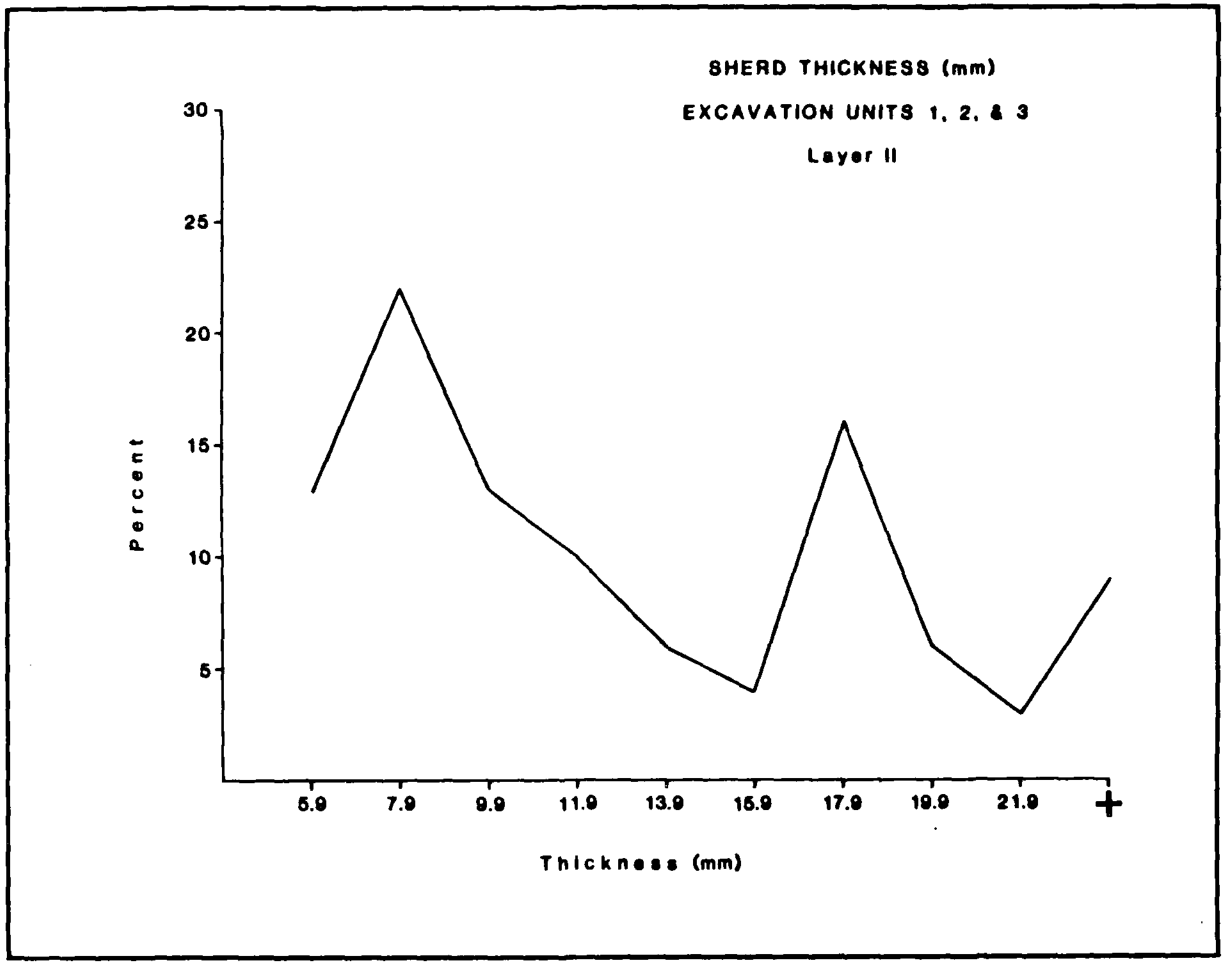


Figure 14. Graph of sherd thickness in Layer II of Excavation Units 1, 2, and 3.

Table 7. Thickness measurements (mm) from body sherds by temper type, Excavation Units 1, 2, 3.

CST				VST	No Temper	MST
14.5	16.4	5.6	5.5	9.2	8.2	7.1
4.6	7.0	16.9	23.5	9.6	7.2	4.8
15.0	16.4	7.5	9.0	8.8	7.6	10.7
16.6	5.5	15.0	20.0	17.5	7.0	
17.5	22.7	16.8	11.0	6.0	6.1	
5.4	31.7	10.6	30.5	9.5	6.7	
11.2	21.9	11.5	16.5	8.7	6.2	
12.0	18.5	11.9	16.5		24.9	
8.2	17.4	8.3	19.7		5.6	
5.6	8.5	35.0	6.8		8.8	
13.6	8.2	7.5	7.1		18.0	
5.0	7.7	17.0	15.4		14.0	
10.2	5.0	6.6	5.9		10.5	
4.3	5.0	10.6	6.0		7.1	
12.2	10.0	9.3	16.3			
18.6	9.4	9.1				
mean = 12.60				mean = 9.90	mean = 9.85	mean = 7.53
s.d. = 6.70				s.d. = 3.56	s.d. = 5.52	s.d. = 2.97

500 or slightly older, based on a corrected radiocarbon date of A.D. 630-1045 taken from 70-80 cm. below surface in the South Profile.

It may be mentioned that a possible problem with the present and previous graphical analyses of thickness data concerns the combining of thickness data from sherds of various temper types. Since it is known that sherds with different tempers must come from different vessels, combining the thickness data may be masking some important variability (e.g., possibly CST vessels from different time periods were very different, but by combining CST thickness data with VST and MST thickness data, this variability is obscured, resulting in curves that do not accurately reflect the true nature of the data.

With respect to surface decoration, only a single sherd from Excavation Units 1, 2, and 3 contained any such evidence. This

was a sherd from Excavation Unit 3, level 4, which contained a checked pattern on what is apparently the interior surface (see Fig. 15). The pattern is very indistinct. The interior of the checks are slightly depressed and the edges are formed by slightly raised ridges. The sherd, which is 24.9 mm thick, has no recognizable temper.

The checked pattern is apparently similar or the same to what Moore (1983:109-111) refers to as "mat impressed." She recorded 10 such sherds from the 60-90 cm levels of the Grid Squares, and one from Layer III of the South Profile. The 3 sherds with mat impressions illustrated from the Grid Squares (Moore 1983:110) do not appear to have a similar design to the sherd of Excavation Unit 3, though the South Profile sherd appears quite similar (see Moore 1983:111). Whether these design differences have any temporal significance is uncertain, though the sherds in the Grid Squares appear to be too late to be associated with the sherd found in Excavation Unit 3.

Surface treatment of all other sherds was limited to only smoothing.

With respect to rim form, all rims recovered from the Excavation Units are illustrated in Figure 16. None of the rims contained decoration and none were the Type B thickened rim. Moore (1983:130) notes that Type B rims do not appear below 70 cm in the Grid Squares, and therefore this type of rim must date slightly later than A.D. 800. This is probably the clearest indication that the deposits of Excavation Units 1, 2, and 3 must definitely be older than A.D. 800 (or pre-latte in age).

Vessel shape can also provide temporal clues, and some of the rims illustrated in Figure 15 are large enough to indicate shape. Both carrinated and globular vessels appear to be absent, which represent the earliest and latest forms, respectively (see Moore 1983:161). Where form can be discerned, the intermediate vessel types appear to most representative of what was found in Excavation Units 1, 2, and 3. These correspond to Layers II and III in Moore's (1983:161) seriation of vessel form. These vessels are bowls which have straight or slightly flaring sides and flat or slight rounded bases. While none of the vessels in the present sample appear to have had flat bases, the other characteristics are quite similar for at least 4 of the illustrated rims (Fig. 15). Two other rims (Type A) have what appear to be pronounced inward curves, which may be more typical of the earlier carrinated bowls. However, since so little work has been done on the temporal characteristics of vessel form, and also because the present sample is so limited, it would be imprudent to make anything other than very general chronological inferences based on vessel form at this time.

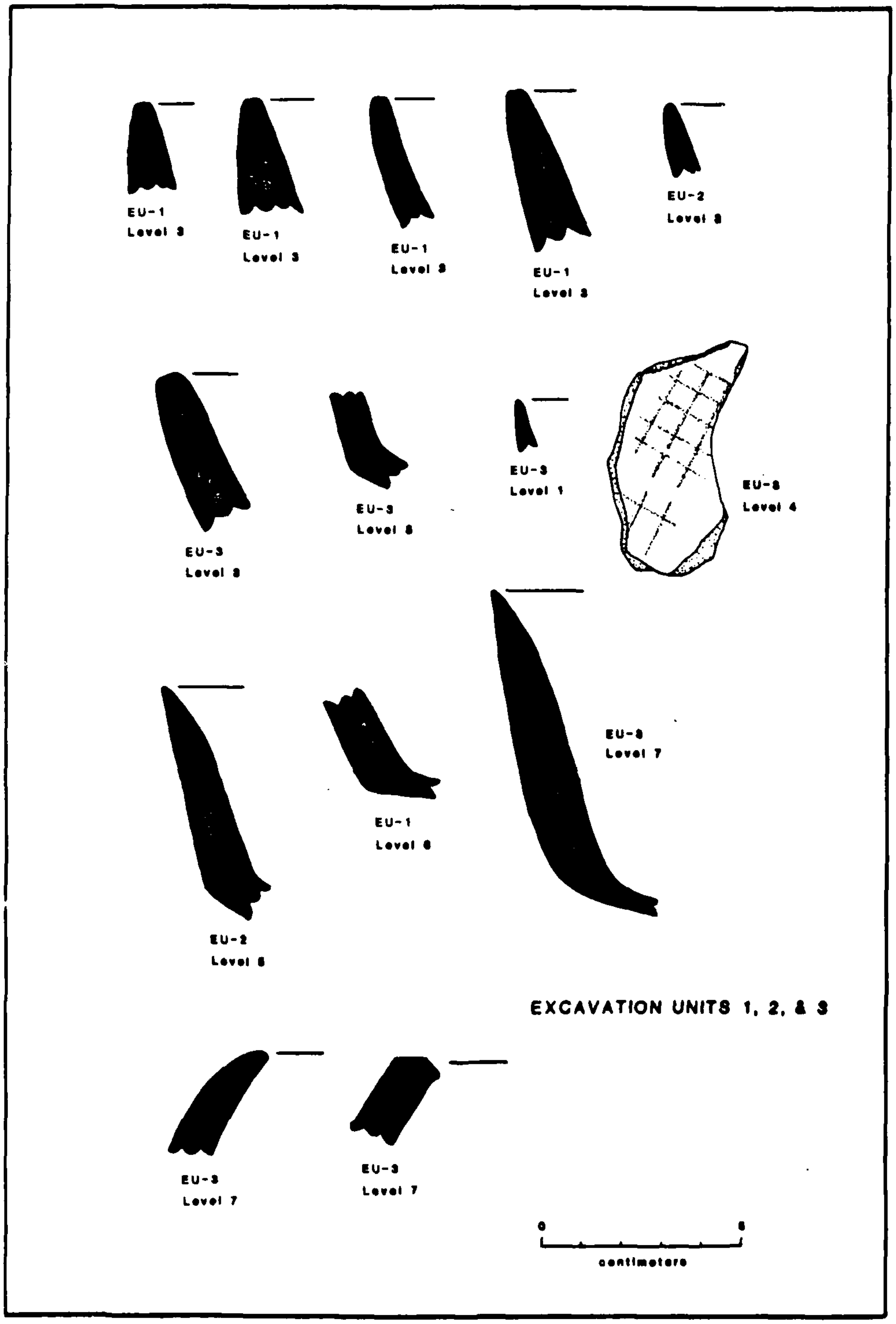


Figure 15. Rim sherd profiles from Excavation Units 1, 2, and 3.

Excavation Unit 4

A total of 470 pottery sherds were excavated from Excavation Unit 4. These are listed by level in Table 8, where rims, decorated body sherds, and temper types are also indicated. Sherd density for the entire excavation unit amounted to 326 sherds per cubic meter. For Layer III, the primary cultural layer, sherd density is 1,329 sherds per cubic meter. These values are considerable higher than density calculations for either Excavation Units 1-3 or the South Profile.

The procedure and problems associated with temper analysis were the same as indicated previously for Excavation Units 1-3, with the difference that small sample size was not a problem for levels 1 through 4. Results of the temper analysis are presented in Table 9, where percentages by levels are given for each major type. Several interesting trends are apparent. One of these concerns the high values for MST in levels 1 through 6. VST values were generally intermediate for these levels, while CST and No Temper values are quite low. Levels 2 through 4 correspond to Layer III, level 5 to Layer IV, and level 6 to Layer V. In contrast, level 7, corresponding to the very top part of Layer VI (the top 10 cm of a layer slightly more than 1 meter thick) contains an extremely high percentage of CST. Below level 7 the sherd counts are so low that the percentage figures have little meaning (the lowest sherd was a single tiny fragment in level 10, which is about the mid point for the Layer VI sediments).

Comparison of the Excavation Unit 4 temper analysis with data from the Grid Squares (Moore 1983:81; see Fig. 2 herein) show a very close correspondence between Layer III of the former with levels 1 through 4 (10 to 40 cm below surface) of the latter for all the temper types. As the 70 to 80 cm depth of the Grid Squares is estimated to date between A.D. 630-1045 (corrected), it is clear that Layer III of Excavation Unit 4 should date quite late if the correspondence has any validity. In fact, Layer III has a date of A.D. 1420-1650 (corrected), which is exactly what would be expected for the upper levels of the Grid Squares. There clearly appears to be a degree of between-site patterning in the temper analysis.

With respect to the lower levels where CST percentages are higher (i.e. level 7 of Layer VI) in Excavation Unit 4, the greatest degree of similarity to the Grid Squares is with levels 10 and 11 (Layer II of the Grid Squares). Unfortunately, however, the sherd counts are relatively low for level 7 in Excavation Unit 4, so a precise correlation cannot be expected (or in any case the data cannot be considered reliable). Nevertheless, assuming the validity of this correspondence and

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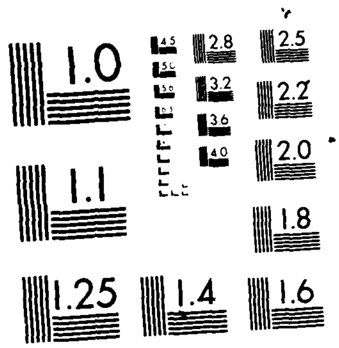

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Table 8. Pottery recovered from Excavation Unit 4.

Level	Total Sherds	Rims*	Decorated Body Sherds*	Body sherds			
				No Temper	VST	MST	CST
1	70	-	2_v 1_n	2	27	28	10
2	145	2_v 2_m	2_m	26	37	58	18
3	147	2_v 1_m 1_c	2_v 1_m	-	50	87	3
4	47	1_v 1_m 1_n	1_v	-	14	26	3
5	24	-	-	-	6	17	1
6	18	-	-	-	3	11	4
7	13	1_m	-	-	-	-	12
8	3	-	-	-	1	1	1
9	2	-	-	-	-	-	2
10	1	-	-	1	-	-	-
TOTALS	470	12	9	29	138	228	54

* n = no temper　　v = VST
m = MST　　c = CST

Table 9. Percentage of pottery temper types from Excavation Unit 4.

Level	No Temper %	VST %	MST %	CST %
1	4	41	40	14
2	18	27	43	12
3	0	37	60	3
4	2	34	57	6
5	0	25	71	4
6	0	17	61	22
7	0	0	8	92
8*	0	33	33	33
9*	0	0	0	100
10*	100	-	-	-

* Percentage figures are probably biased due to extremely small sherd counts in these levels.

also an estimate that the base of Layer I in the Grid Squares must date to about A.D. 500, Layer II (levels 10 and 11) of the Grid Squares must date to between 0 and 500 A.D. Since there is no corresponding date from level 7 of Excavation Unit 4, this estimate cannot be independently checked, though it seems to be approximately what would be expected.

Thickness data for Excavation Unit 4 are presented in Table 10. Mean thickness and standard deviation for each temper type are also given for Layers II-III and Layer VI (the other layers did not have sufficient counts to make calculation of these figures worthwhile). It may be observed that for Layer II-III the thickest pottery has VST temper and the thinest has CST. The CST pottery in La er VI, however, is much thicker on average than even the VST in Layer II-III. Whether this difference in CST

Table 10. Thickness measurements (mm) from body sherds by temper type, Excavation Unit 4.

	CST		MST					VST				No Temper
Layer I	8.1	12.3	7.0	9.5	9.8	12.0	8.4	15.6	7.2	9.8	7.8	14.3
	9.6	6.0	7.8	10.0	5.4	8.3	5.2	8.2	11.6	7.2	9.1	8.9
	5.0	4.5	4.8	5.3	8.3	5.6	11.5	7.5	8.0	9.3	8.6	8.4
	6.0	6.4	4.4	6.4	7.6	9.1	9.2	7.6	12.2	6.8	8.0	
	6.0	6.8	9.0	7.6	10.4			9.3	8.8	5.3	6.1	
								8.0	12.2	7.7		
Layer II-III	8.5	10.3	10.0	8.5	8.3	6.4	13.3	5.8	9.0	8.6	9.5	10.1
	10.2	9.5	13.0	11.2	10.0	10.8	8.6	6.0	11.0	6.6	9.2	11.0
	5.4	5.1	15.0	11.1	9.5	11.6	17.2	8.1	12.5	7.2	12.0	7.2
	5.6	8.4	10.7	10.5	10.1	9.0	11.0	9.7	10.4	8.7	9.3	7.8
	6.1	5.7	7.8	10.0	8.9	8.0	8.8	9.3	8.5	11.0	5.7	9.5
	7.0	5.4	9.3	12.9	7.5	9.3	8.7	8.3	4.9	5.5	4.5	7.9
	6.0	6.4	10.8	8.2	12.1	8.3	9.0	8.6	8.1	4.4	5.3	7.3
	5.0	5.0	7.0	4.7	7.6	11.3	5.8	8.4	7.3	19.0	12.7	5.4
	5.5	5.2	4.4	7.3	8.1	10.1	5.6	6.2	8.2	8.2	13.0	7.0
	4.3	5.6	5.3	5.6	5.3	9.0	6.3	15.2	8.5	8.5	11.3	9.0
			5.2	5.0	4.8	7.6	9.2	8.1	9.3	8.9	6.1	7.8
			6.2	9.0	16.1	6.2	8.5	12.0	11.2	11.9	6.4	5.5
			5.4	6.1	8.4	9.1	5.9	8.5	7.7	7.4	11.6	8.1
			5.6	7.5	7.5	9.6	10.9	8.4	5.2	6.7	8.8	
			8.2	6.1	7.0	7.6	6.8	11.0	7.8	8.5	7.6	
			7.3	6.0	11.0	6.5	5.0	8.7	6.9	10.3	4.8	
			6.6	6.0	7.6	6.9	8.4	5.2	8.0	7.3	8.5	
			7.5	6.4	5.8	5.0	5.2	6.7	8.0	6.0	5.3	
			7.7	4.8	8.9	5.0	7.0	4.6	11.4	6.9	4.8	
			5.1	8.5	7.2	8.3	9.6					
			5.2	5.5	9.0	5.3	6.4					
			6.2	5.3	4.5	5.8	5.1					
			6.4	7.3	6.9	7.8	6.5					
			6.2	6.1	6.8	4.6	4.9					
			7.1	5.0	4.8	6.1	4.3					
			8.9	4.3	7.6	4.6	6.1					
			6.3	4.1	11.2	4.8	10.0					
			5.1	6.6	7.1	6.8	5.8					
			4.9	4.8	9.2	6.5	6.3					
			6.2	6.5	5.2	4.8	4.6					
			5.7	6.9	5.5	6.1	6.2					
			7.0	4.7	5.8							
	mean = 6.51		mean = 7.45					mean = 8.43				mean = 7.97
	s.d. = 1.83		s.d. = 2.40					s.d. = 2.62				s.d. = 1.63

cont.

Table 10. Thickness measurements (mm) from body sherds by temper type, Excavation Unit 4 (cont.).

	CST		MST					VST			No Temper
Layer IV	4.5		11.4	9.6	6.1	3.6	5.1	6.2	14.8	8.6	
			5.2	5.5	9.6	6.4	6.5				
			5.0	3.8	4.3	4.3	5.1				
Layer V	12.7	12.0	13.3	7.8	6.1	9.0	4.2	10.0	7.4	9.5	
			6.4								
Layer VI	11.8	12.0						7.8			
	9.5	10.9									
	9.1	9.2									
	9.3	9.4									
	8.7										
	mean = 9.98										
	s.d. = 1.24										

values for the two layers is simply due to small sample bias is uncertain. Further investigation with a larger sample would be of interest.

A graph of the Layer II-III data is presented in Figure 16 (other layers were not graphed due to small sample size). This graph shows virtually no similarity to any of Moore's (1983:97) graphs for the South Profile. This not surprising, however, as Moore's Layer I data, which brackets the occupational time span in Layer II-III of Excavation Unit 4, represents a composite profile for the entire layer. Until the Grid Square data is graphed, a more appropriate comparative analysis cannot be made. It may be noted that the Excavation Unit 4 graph is completely different from the Excavation Unit 1-3 graph. The former concerns the latte period, while the latter concerns the pre-latte period.

With respect to surface decoration, there are a total of 9 sherds containing decoration. In all cases this amounted to a combed design on the exterior vessel surface. All such sherds were derived from levels 1 through 4. This type of design was

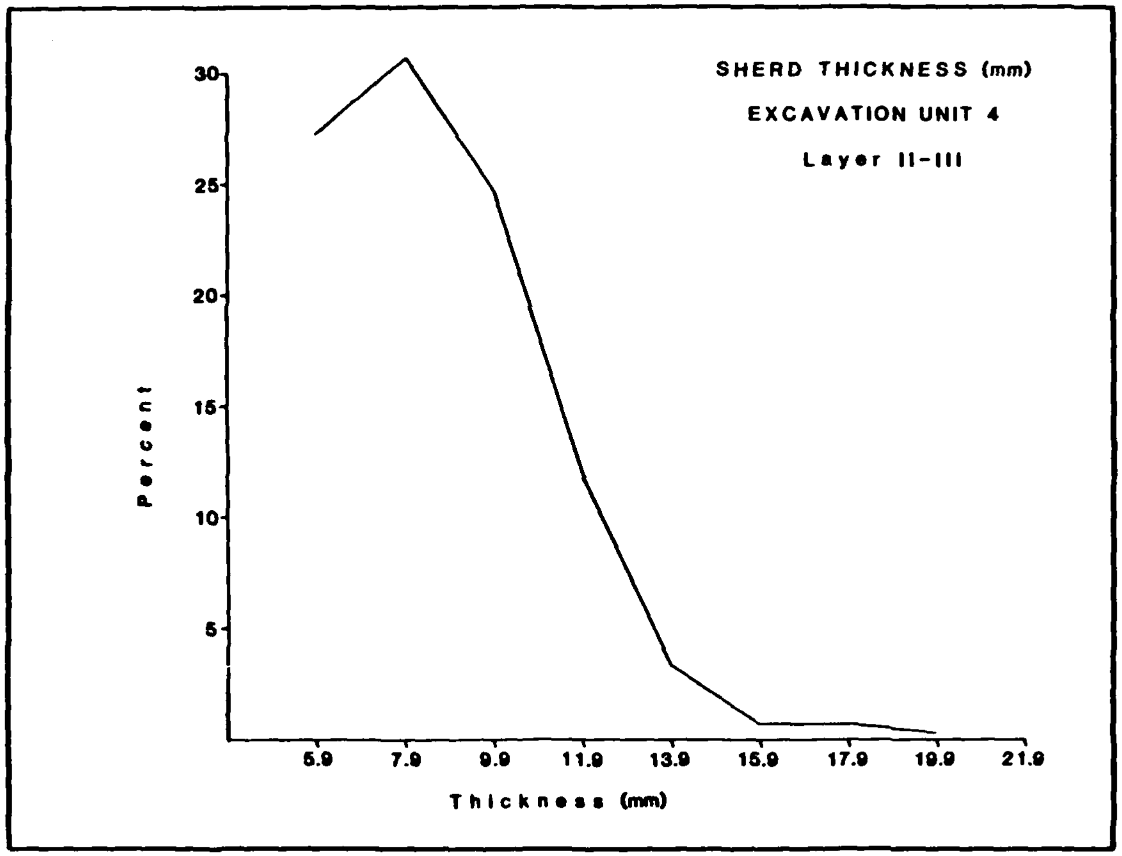

Figure 16. Graph of sherd thickness in Layer II-III of Excavation Unit 4.

associated with the upper 50 cm of the Layer I deposits in the Grid Squares (Moore 1983:108), which would be the later part of the latte period. This time frame is consistent with the dating of Layer III in Excavation Unit 4.

The only other type of decorative treatment noted on the sherds from Excavation Unit 4 was that of surface smoothing on many of the sherds. No analysis was performed concerning this type of treatment, however.

A total of 12 rim sherds were collected in Excavation Unit 4. These are all illustrated in Figure 17. Most of the rims can be clearly identified as the Type B thickened rim variety that is associated with latte period sites. Moore (1983:130) indicates that in the Grid Squares no Type B rims were recovered below 70 cm. in Layer I, which is thought to date to approximately A.D. 800 (corrected date of A.D. 630-1045). In Excavation Unit 4, all Type B rims are from level 4 and above. This is consistent with the dating of Layer II-III, which as previously indicated, pertains to the late latte period.

With respect to vessel shape, rim profiles suggest that most of the vessels were of a globular type with constricted openings. Such a form falls clearly within Moore's (1983:161) Layer I seriation. Constricted globular vessels do not seem to have been present on Guam prior to the time period represented by Layer I (70 cm level in the Grid Squares), which has a beginning date of approximately A.D. 800, as just noted. Two small bowl forms were also noted in Excavation Unit 4. They were found in levels 3 and 7. These forms can occur throughout a broad time range (Moore 1983:161).

In terms of comparing the pottery findings of Excavation Unit 4 with those of Excavations Units 1-3, it is clear that Layer VI of the former corresponds with Layer II of the latter. Furthermore, it appears likely that the Layer VI deposits are a remnant of a former pre-latte occupation in which the pottery has infiltrated from a now missing occupation layer. It is unlikely that the sherds are the result of redeposition through wave disturbance. If this had been the case, sherds should be found distributed throughout Layer VI, which they are not (the deepest sherd is in level 10, which is only the middle part of this stratigraphic unit). Though sherds are distributed throughout Layer II of Excavation Units 1-3, it will be recalled that Layer II is a relatively thin stratigraphic unit, allowing infiltration to proceed to base of the layer.

The findings in Excavation Unit 4, furthermore indicate that it is unlikely that Layer III in Excavation Units 1-3 is a cultural layer. This layer corresponds to Layer VII in Excavation Unit 4, which has virtually no indication of cultural activity, save a trace of charcoal which has presumably infiltrated from above.

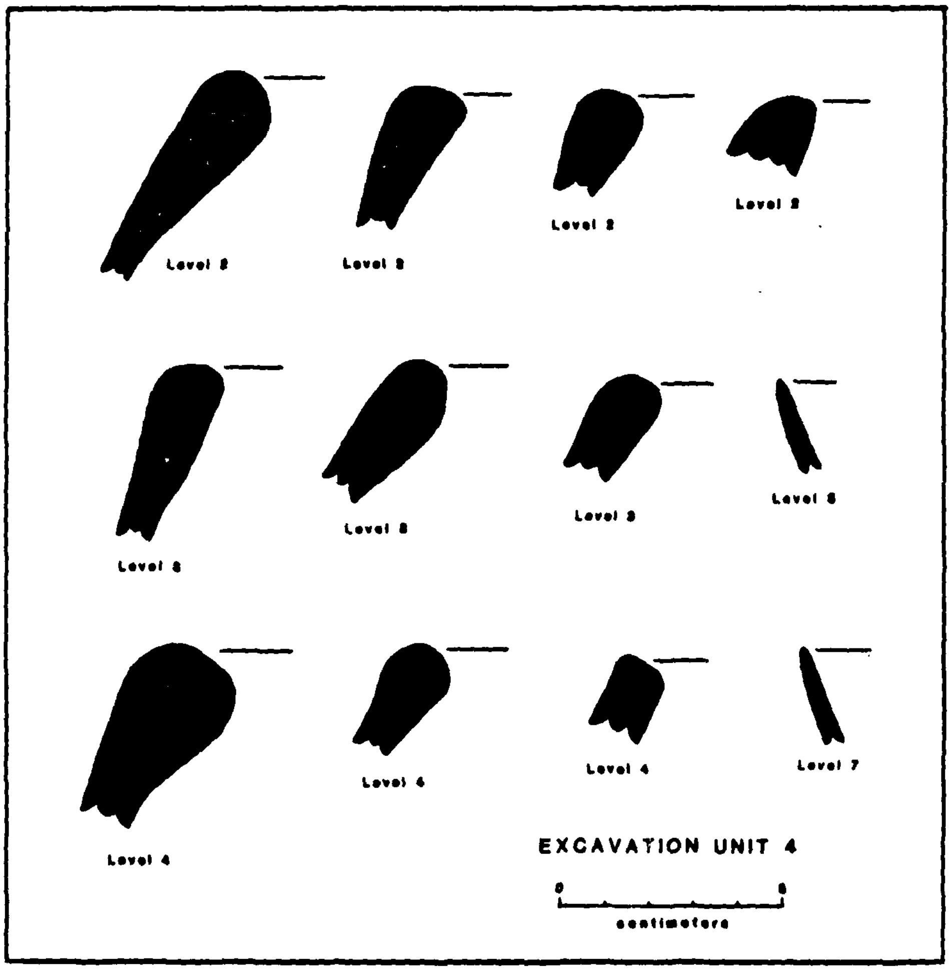

Figure 17. Rim sherd profiles from Excavation Unit 4.

Excavation Unit 5

A total of 171 pottery sherds were recovered in Excavation Unit 5. These are listed by level in Table 11, where rims, decorated body sherds, and temper types are also indicated. Sherd density for the entire excavation unit amounted to 103.8 sherds per cubic meter. Layer V (level 5), which is the densest cultural layer, has a sherd density of 533 sherds per cubic meter. Layer III (levels 2b and 3), the other major occupation layer in Excavation Unit 5, has a sherd density of 239 sherds per cubic meter. All of these figures are considerably higher than the South Profile density calculation (49.3 sherds/m^3), although not nearly as high as that of in Excavation Unit 4.

Pottery analysis for Excavation Unit 5 was performed similarly to the other excavation units. The main problem encountered during the study concerns possible sample bias due to the generally low sherd counts. Even in Layer V, which had the highest density of all the layers, there were only 72 sherds.

With respect to temper analysis, results are presented in Table 12, which shows percentages by level for each of the major temper types. One curious factor brought out by this table is the high percentage of CST sherds in level 3, which seems quite anomalous for what is clearly a <u>latte</u> period layer (the radiocarbon date is A.D. 1400-1515, corrected). As such, it is suspected that sample bias is most likely the cause. As the lower levels do not contain CST sherds, it appears that pre-<u>latte</u> deposits are not represented in Excavation Units 5.

The temper percentage figures for level 5, which has the highest number of pottery sherds, may be compared to figures reported for the Grid Squares (see Fig. 2). As will be noted, there is virtually no correspondence or similarity to the level 5 data anywhere on the Grid Squares graph. Given the radiocarbon date of A.D. 1260-1405 (corrected), it would be expected that the figures would have approximately corresponded to those of levels 3 to 6 of the Grid Squares (given the correctness of associating the A.D. 630-1045 radiocarbon date with the 70-80 cm. level of the Grid Squares). Sample bias, again, may be the problem. Other levels were not compared to the Grid Squares data due to the problem of low sherd counts, which would render the findings of doubtful merit.

Thickness data for Layers III, IV, and V are presented in Table 13, along with means and standard deviations for each of the layers and temper types. The other layers did not have sufficient sherd counts to warrant examination of thickness data. With respect to Excavation Unit 4, Layer II-III, the means in Layer V for MST and VST sherds are slightly greater though still

Table 11. Pottery recovered from Excavation Unit 5.

Level	Total Sherds	Rims*	Decorated Body Sherds*	Body sherds No Temper	VST	MST	CST
1	4	-	1_v	-	-	3	-
2 (a)	9	-	1_v	-	2	6	-
2 (b)	15	-	-	-	1	14	-
3	28	-	-	-	1	11	16
4	22	-	-	1	9	12	-
5	72	5_v	-	-	48	19	-
6	11	-	-	-	9	2	-
7	3	-	-	-	2	1	-
8	2	-	-	-	2	-	-
Feat.-1	2	-	-	-	2	-	-
Feat.-3	3	-	-	-	3	-	-
TOTALS	171	5	2	1	79	68	16

* n = no temper v = VST
m = MST c = CST

well within the range of the standard deviations. For Layer III of Excavation Unit 5 the values are slightly less (than Layer II-III of Excavation Unit 4), though still well within the range of the standard deviations.

A graphical presentation of the Layer V thickness data is provided in Figure 18 (other layers were not graphed due to small sample size). Comparing this graph with those of Moore (1983:97) for the South Profile, it may be seen that there is a fair degree of similarity with her Layer I graph. Both graphs have their

Table 12. Percentage of pottery temper types from Excavation Unit 5.

Level	No Temper %	VST %	MST %	CST %
1*	0	25	75	0
2 (IIa)*	0	33	66	0
2 (IIb)*	0	7	93	0
3	0	4	39	57
4	5	40	55	0
5	0	74	26	0
6*	0	82	18	0
7*	0	67	33	0
8*	0	100	0	0
Feat.-1*	0	100	0	0
Feat.-3*	0	100	0	0

* Percentage figures are probably biased due to extremely small sherd counts in these levels.

peaks between 7.9 and 11.9 in the 20 to 30 percent range, dropping steeply on both sides. Since Layer I represents the latte period of the South Profile, this result suggests that there is a certain amount of patterning in the thickness data between latte sites. As indicated in the Excavation Unit 4 discussion, however, the South Profile graph for Layer I is a composite representation of latte deposits, and as such it holds little interest. The real problem is to try to break down the latte period into a number of discrete temporal units, and unfortunately the South Profile thickness data are of little help in this regard.

Table 13. Thickness measurements (mm) from body sherds by temper type, Excavation Unit 5, Layers III, IV, and V.

	MST		VST			CST	
Layer III	7.1	10.8		9.8		7.4	7.5
	10.1	6.4				7.8	7.5
	5.4	7.2				7.1	6.4
	7.6	6.6				9.5	7.5
	8.2	7.6				5.9	5.9
						7.0	5.7
						8.4	5.8
						4.9	8.4
	mean = 7.70					mean = 7.04	
	s.d. = 1.65					s.d. = 1.21	
Layer IV	8.0	8.8	6.9	6.2			
	7.1	5.8	9.5	11.1			
	6.6	10.5					
	6.1	5.6					
	5.9	5.6					
	mean = 7.00		mean = 8.42				
	s.d. = 1.63		s.d. = 2.28				
Layer V	13.7	9.3	10.3	8.4	11.4		
	10.8	7.3	11.3	13.7	13.0		
	12.3	11.8	14.1	12.7	11.1		
	5.8	9.5	10.4	9.6	9.3		
	7.8	10.6	6.9	8.5	9.7		
	12.1	7.4	6.7	12.8	11.0		
	9.5	7.0	9.6	10.6	10.2		
	7.1	4.2	11.4	7.3	9.6		
			10.4	7.3	11.4		
			9.6	10.0	8.3		
			10.2	12.3	8.4		
			7.1	7.5	6.4		
			7.8	7.5	7.3		
	mean = 9.14		mean = 9.77				
	s.d. = 2.60		s.d. = 2.06				

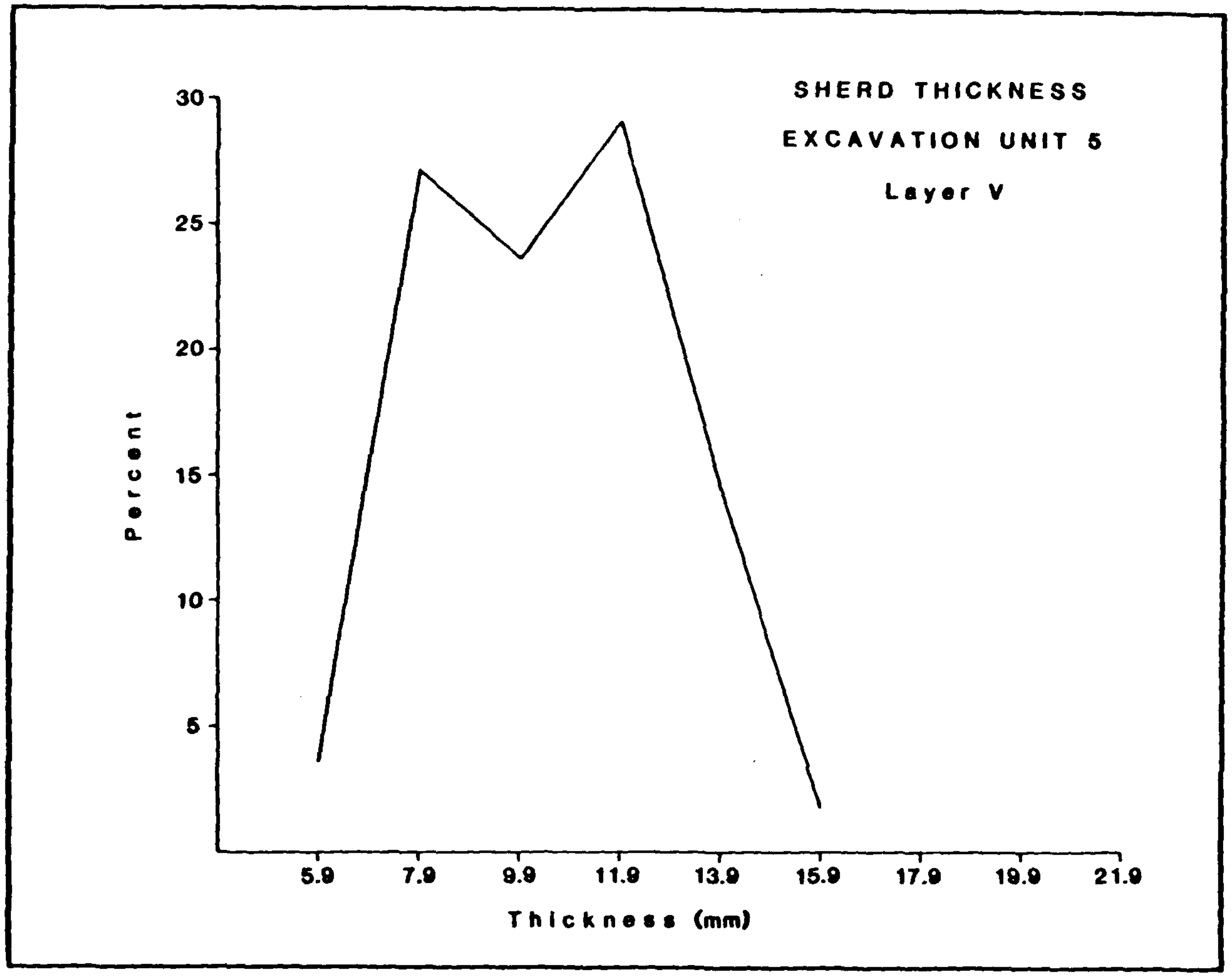

Figure 18. Graph of sherd thickness in Layer V of Excavation Unit 5.

With respect to surface decoration, only 2 sherds from Excavation Unit 5 showed any evidence of decoration. In both cases there was a combed design on the sherd's exterior surface. These sherds were recovered from levels 1 and 2, which is consistent with the late latte period reported for this technique in the Grid Squares (Moore 1983:108). Except for smoothing on many of the sherds, no other decorative elements were observed on the sherds from Excavation Unit 5.

Only 5 rim sherds were collected from Excavation Unit 5, and all of these were from Layer V. The rims are all illustrated in Figure 19. They may be clearly identified as Type B thickened rims, which is the type typically associated with the latte period. The dating of Layer V at A.D. 1260-1405 is consistent with this determination.

With respect to vessel shape, rim profiles suggest that most of the vessels were of a globular type with constricted openings. This form falls clearly within Moore's (1983:161) Layer I seriation, which has a beginning date of A.D. 800. This, of course, is consistent with the dating of Layer V, as mentioned in the preceding paragraph.

Since the pottery of both Excavation Units 4 and 5 belong to the latte period, and that of Excavation Unit 4 is slightly later as determined by a radiocarbon date, there is an excellent opportunity for comparisons. Are there differences between the pottery assemblages of two latte sites that are known to date to slightly different time periods? Some differences might be expected, especially in view of the temper data provided by Moore for the Grid Squares (see Fig. 2). Unfortunately, however, this question must remain largely unanswered as the small sample of pottery from Excavation Unit 5 precludes any kind of definitive statement. It is important, however, to note that Excavation Unit 4, where the pottery sample was much larger, did provide a considerable degree of correspondence with the Grid Squares data. At the very least, therefore, further efforts in the seriation of latte period pottery are definitely warranted and should be pursued as part of any future research effort.

Non-ceramic Artifacts

Relatively few non-ceramic artifacts were encountered in the material recovered from Excavation Units 1 through 5. Analytical possibilities, therefore, are limited, and this section will be primarily concerned with listing the artifacts and providing a brief description. Metal fragments and obviously recent glass fragments are not not considered artifacts for purposes of this discussion.

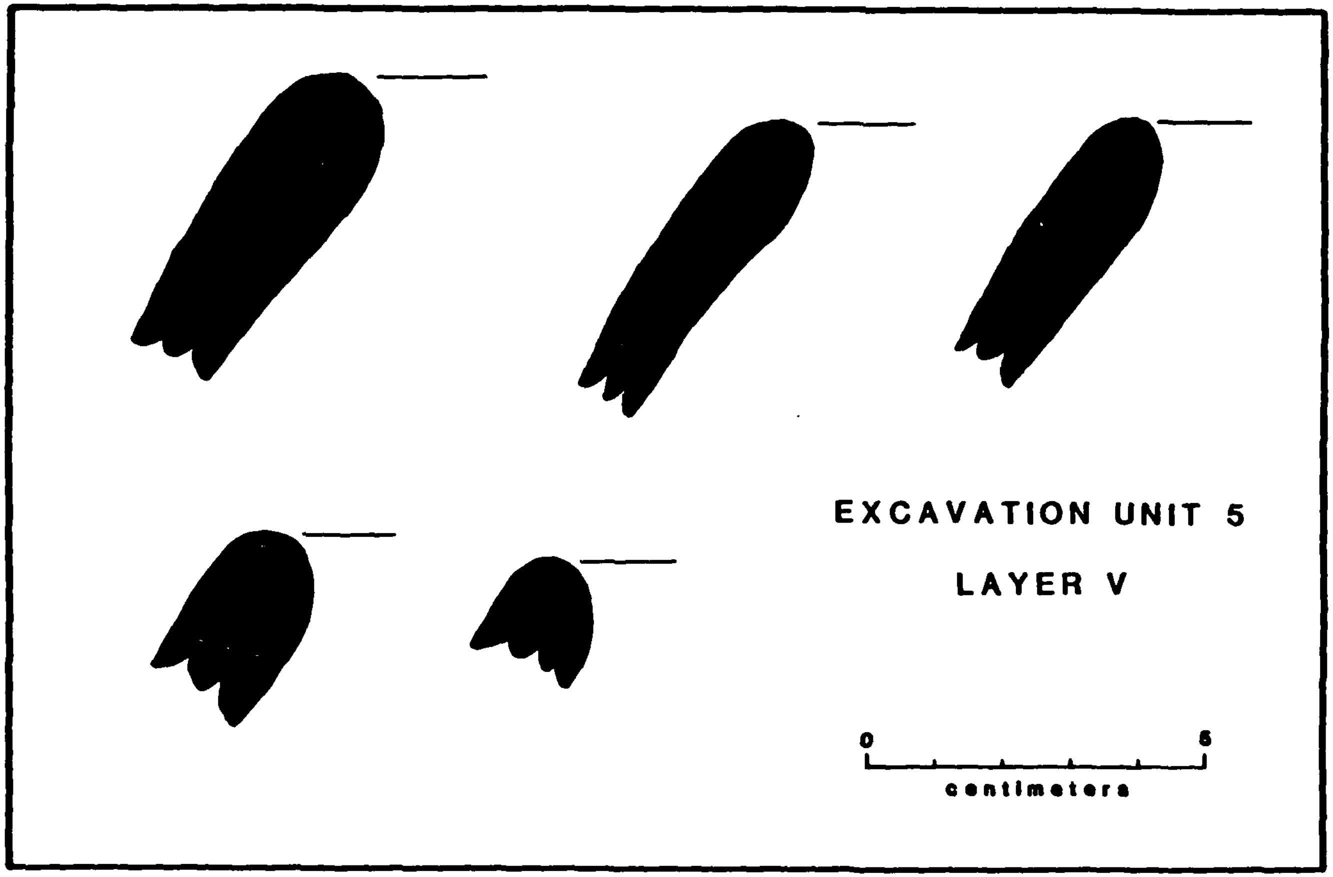

Figure 19. Rim sherd profiles from Excavation Unit 5.

Excavation Unit 1

The only artifact recovered from this excavation was a possible cut pearl shell fragment from level 5. The fragment measures approximately 1 x 1 cm and appears to have cut marks on two sides.

Excavation Unit 3

Two possible cut pearl shell fragments were recovered from level 4 of this test unit. Both fragments have possible holes drilled on the edges and each have what appear to be cut marks on two sides. The fragments measure 2 x 1.5 cm and 1.7 x 1.2 cm.

Excavation Unit 4

This excavation unit yielded 1 *Tridacna* lip adze fragment, 2 slingstones, 1 basalt flake, and 4 pieces of basalt shatter.

The adze fragment is from level 3; only the bit portion is missing. Measurements are 9 x 5.3 cm. No smoothing is evident on the exterior surface.

A basalt slingstone is from level 2; its maximum dimensions are 5.25 x 3.32 cm, and the weight is 58.3 grams. A portion of 1 side was fractured and is missing. The other slingstone is made of coral and is from level 3. Its maximum dimensions are 4.71 x 2.59 cm, and the weight is 35.4 grams. The specimen is in perfect condition.

A basalt flake was recovered from level 3. It has a platform and bulb of percussion. Measurements are 2.2 x 1.3 cm There were also 2 pieces of basalt shatter from level 3, 1 from level 4, and 1 from level 5. These are all small fragments 1 to 1.7 cm in maximum length.

Excavation Unit 5

This excavation unit yielded 2 bullets, 1 shell bead, 3 pieces of basalt shatter, and 1 small limestone fragment that may be a smoothing or polishing stone.

The 2 bullets were from level 1; one of these is large caliber (possibly 50 caliber) and the other is small caliber (possibly 7.6 mm).

The shell bead is from level 2(b). It is 9.6 mm in diameter and has a hole 2 mm in diameter. The bead is circular in shape.

The basalt shatter is from levels 2(a), 2(b), and 3 (1 piece each). The fragments range in size up 3.7 cm in maximum length.

The limestone fragment is rectangular in shape and flat on 2 sides. One of the sides seems to be somewhat polished, as if the surface had been used for smoothing or polishing. The stone measures 3 x 4.5 cm, and is 1.5 cm thick.

Marine Shell Midden

Results of the identification of marine shell midden is presented in Tables 14, 15, and 16. All marine midden was identified in Excavation Units 4 and 5; in Excavation Unit 1 only the 1/8 inch screen fraction was processed. No marine midden was analyzed in Excavation Units 2 and 3 since it was thought that this would be redundant to the findings for Excavation Unit 1. Since Tables 14, 15, and 16 are all derived from only 1/8 inch screening, they are directly comparable to one another. For purposes of this analysis concentration indices will not be calculated for individual taxonomic units. Aggregate shell concentration indices are presented for each level in Tables 2, 3, and 4. If a finer breakdown is required, sediment volumes are provided for each level in these tables and the reader may proceed with his or her own calculations.

The primary objective of this analysis will be the determination of the most commonly exploited species within particular excavaton units (i.e., levels). To do this weight percentages were calculated for each species or taxonomic unit for each level. The percentages are based upon total gastropod weight for the gastropods, and total bivalve weight for the bivalves (see Tables 14, 15, and 16). Thus, this analysis will make it possible to identify the most common gastropod species and the most common bivalve species in the deposits.

Before continuing, several remarks should be made concerning interpretive problems with the determination of the most commonly exploited shell species. As noted previously in the section describing field investigations, it is highly likely that that a certain amount of the shell is naturally present in the excavated deposits. This is particularly evident in levels which are clearly non-cultural, such as the lower levels of Excavaton Units 4 and 5. As a very rough estimate, figures from these levels indicate that anywhere from 10% to 30% of the shell midden in the cultural levels may be natural. At this time no attempt will be made to "factor out" the natural midden from the cultural midden

Table 14. Marine shell midden, Excavation Unit 1, 1/8 inch screen.

LEVEL	1		2		3		4		5		6		7	
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%
GASTROPODA														
Trochus spp.	1.1	5.6	1.7	7.1	5.4	8.9	3.7	3.4	5.0	9.5	7.4	15.7	6.1	17.6
Turbo argyrostomus	-	-	2.7	11.3	4.8	7.9	23.3	21.6	2.1	-	5.5	11.7	4.7	13.5
Turbo spp. operculae	0.2	1.0	0.2	0.8	5.0	8.2	0.1	0.1	0.9	1.7	0.3	0.6	-	-
Turbo spp.	0.7	3.6	-	-	-	-	-	-	-	-	-	-	-	-
Nerita plicata	-	-	0.2	0.8	0.3	0.5	1.2	1.1	0.3	0.6	0.1	0.2	0.2	0.6
Nerita polita	-	-	-	-	1.7	2.8	0.5	0.5	1.0	1.9	1.2	2.6	0.8	2.3
Nerita spp.	0.9	4.6	1.8	7.5	4.0	6.6	9.1	8.4	2.5	4.7	1.7	3.6	1.8	5.2
Cerithrium	-	-	1.2	5.0	2.8	4.6	2.7	2.5	4.5	8.5	0.3	0.6	1.0	2.9
Rhinoclavis sinensis	-	-	-	-	2.1	3.5	1.8	1.7	0.6	1.1	-	-	-	-
Rhinoclavis spp.	0.4	2.1	0.6	2.5	0.8	1.3	1.0	0.9	0.7	1.3	2.8	6.0	1.5	4.3
Strombus mutabilis	0.9	4.6	1.5	6.3	11.4	18.8	16.6	15.4	9.0	17.1	3.4	7.2	7.6	21.9
Strombus spp.	1.5	7.7	0.4	1.7	-	-	-	-	-	-	-	-	-	-
Hipponicidae	-	-	-	-	-	-	0.1	0.1	-	-	-	-	-	-
Cypraea annulus	-	-	-	-	-	-	8.8	8.1	-	-	0.6	1.3	-	-
Cypraea spp.	0.1	0.5	1.1	4.6	0.2	0.3	2.1	1.9	0.9	1.7	1.0	2.1	1.6	4.6
Cymatium spp.	0.5	2.6	-	-	0.1	0.2	12.4	11.5	0.8	1.5	2.0	4.3	-	-
Bursa spp.	-	-	0.1	0.4	-	-	-	-	-	-	-	-	-	-
Muricidae	1.8	9.2	2.2	9.2	12.3	20.3	7.1	6.6	10.0	19.0	4.3	9.1	0.8	2.3
Engina spp.	-	-	-	-	2.2	3.6	0.8	0.7	-	-	0.5	1.1	0.1	0.3
Cantharus spp.	-	-	0.3	1.3	0.3	0.5	-	-	-	-	-	-	-	-
Nassariidae	0.5	2.6	-	-	-	-	-	-	-	-	-	-	-	-
Vasum turbinellus	-	-	-	-	-	-	-	-	6.0	11.4	4.6	9.8	0.4	1.2
Mitra spp.	0.4	2.1	-	-	0.7	1.2	-	-	-	-	-	-	-	-
Conus spp.	0.3	1.5	0.6	2.5	0.2	0.3	0.8	0.7	0.5	0.9	0.2	0.4	0.1	0.3
Siphonariidae	-	-	0.4	1.7	-	-	1.0	0.9	0.3	0.6	0.8	1.7	0.5	1.4
Cellana	-	-	0.8	3.3	0.9	1.5	2.0	1.9	1.0	1.9	0.3	0.6	-	-
Unidentified	10.2	52.3	8.1	33.9	5.5	9.1	13.0	12.0	8.7	16.5	10.0	21.3	7.5	21.6
	------	------	------	------	------	------	------	------	------	------	------	------	------	------
SUBTOTAL	19.5	100.0	23.9	100.0	60.7	100.0	108.1	100.0	52.7	100.0	47.0	100.0	34.7	100.0

LEVEL	1		2		3		4		5		6		7	
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%
BIVALVIA														
Anadara antiquata	-	-	-	-	0.2	1.2	1.0	5.2	-	-	0.1	1.3	-	-
Arca ventricosa	0.3	4.7	0.5	6.8	0.5	3.0	-	-	-	-	0.2	2.7	-	-
Mytilidae	1.3	20.3	1.7	23.3	1.3	7.8	1.9	9.9	1.3	13.3	1.1	14.7	0.5	11.9
Isognomon isognomon	-	-	0.2	2.7	0.2	1.2	0.3	1.6	0.1	1.0	0.2	2.7	0.2	4.8
Scutarcopagia scobinata	0.2	3.1	-	-	-	-	-	-	-	-	-	-	-	-
Tellina spp.	1.3	20.3	1.4	19.2	8.7	52.1	8.4	43.8	3.1	31.6	0.9	12.0	0.3	7.1
Asaphis violascens	0.7	10.9	0.4	5.5	4.3	25.7	0.9	4.7	0.2	2.0	0.9	12.0	-	-
Gafrarium tumidum	-	-	0.2	2.7	-	-	3.0	15.6	0.4	4.1	0.2	2.7	0.3	7.1
Periglypta spp.	-	-	0.6	8.2	0.3	1.8	1.9	9.9	1.4	14.3	0.5	6.7	-	-
Unidentified	2.6	40.6	2.3	31.5	1.2	7.2	1.8	9.4	3.3	33.7	3.4	45.3	2.9	69.0
	------	------	------	------	------	------	------	------	------	------	------	------	------	------
SUBTOTAL	6.4	100.0	7.3	100.0	16.7	100.0	19.2	100.0	9.8	100.0	7.5	100.0	4.2	100.0
	======		======		======		======		======		======		======	
TOTAL	25.9		31.2		77.4		127.3		62.5		54.5		38.9	

Table 15. Marine shell midden, Excavation Unit 4, 1/8 inch screen.

LEVEL	1		2		3		4		5		6		7		8		9		1
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.
GASTROPODA																			
Trochus spp.	6.4	7.0	20.3	7.1	16.6	6.2	28.3	14.7	24.9	8.5	25.8	7.6	7.4	3.3	-	[illegible]	2.4	6.2	5.3
Turbo argyrostomus	16.9	18.4	73.4	25.7	52.3	19.6	53.9	28.1	98.5	33.7	106.1	31.2	99.4	43.7	[illegible]	[illegible]	7.4	19.0	5.1
Turbo spp. operculae	-	-	41.0	14.3	17.6	6.6	17.0	8.8	14.7	5.0	8.9	2.6	7.9	3.5	[illegible]	[illegible]	1.7	4.4	[illegible]
Nerita plicata	2.2	2.4	0.6	0.2	1.5	0.6	0.7	0.4	1.8	0.6	6.4	1.9	0.5	0.2	[illegible]	[illegible]	0.5	1.3	1.8
Nerita polita	1.0	1.1	2.5	0.9	1.8	0.7	0.7	0.4	7.1	2.4	8.0	2.4	5.9	2.6	[illegible]	[illegible]	0.6	1.5	[illegible]
Nerita puperita	1.3	1.4	2.5	0.9	4.2	1.6	4.7	2.4	2.7	0.9	2.9	0.9	4.5	2.0	[illegible]	[illegible]	3.4	8.7	4.0
Cerithrium nodulosum	-	-	2.2	0.8	-	-	-	-	9.9	3.4	-	-	-	-	[illegible]		-	-	-
Cerithrium spp.	2.6	2.8	3.3	1.2	3.0	1.1	3.2	1.7	3.0	1.0	7.8	2.3	3.8	1.7	[illegible]	[illegible]	1.0	2.6	3.7
Rhinoclavis sinensis	0.6	0.7	6.0	2.1	8.0	3.0	1.7	0.9	0.2	0.1	3.9	1.1	0.1	0.0	[illegible]	[illegible]	-	-	0.1
Rhinoclavis spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-
Strombus gibbosus	-	-	2.0	0.7	-	-	-	-	-	-	-	-	-	-			-	-	-
Strombus mutabilis	11.6	12.6	36.2	12.7	30.2	11.3	23.6	12.4	41.1	14.0	55.1	16.2	23.5	10.3	[illegible]	[illegible]	5.2	13.3	4.8
Strombus spp.	-	-	3.4	1.2	3.7	1.4	0.4	0.2	-	-	0.8	0.2	-			-	-	-	-
Hipponicidae	0.1	0.1	-	-	0.1	0.0	0.3	0.2	-	-	0.1	0.0	-	-		-	0.2	0.5	-
Cypraea annulus	-	-	-	-	0.5	0.2	-	-	4.1	1.4	-	-	-				-	-	-
Cypraea isabella	0.6	0.7	-	-	1.1	0.4	-	-	-	-	-	-	0.5	0.2	-		-	-	-
Cypraea moneta	3.6	3.9	3.0	1.0	2.8	1.0	5.0	2.6	-	-	1.9	0.6	0.4	0.2	-	-	-	-	-
Cypraea spp.	1.2	1.3	1.0	0.3	1.9	0.7	1.2	0.6	2.4	0.8	2.1	0.6	2.1	0.9	[illegible]	[illegible]	1.5	3.8	[illegible]
Cymatium spp.	1.0	1.1	2.9	1.0	6.0	2.2	1.2	0.6	1.5	0.5	-	-	7.4	3.3	[illegible]	[illegible]	-	-	[illegible]
Bursa spp.	-	-	1.1	0.4	-	-	-	-	0.9	0.3	0.4	0.1	-	-	-	-	-	-	-
Muricidae drupa	12.1	13.2	21.1	7.4	40.9	15.3	24.5	12.6	35.4	12.1	43.2	12.7	25.5	11.2	[illegible]	[illegible]	1.4	3.6	[illegible]
Engina spp.	0.7	0.8	3.0	1.0	4.0	1.5	0.6	0.3	3.2	1.1	3.7	1.1	2.8	1.2	[illegible]	[illegible]	1.4	[illegible]	[illegible]
Cantharus spp.	0.1	0.1	0.6	0.2	2.4	0.9	2.0	1.0	0.6	0.2	3.4	1.0	1.2	[illegible]	[illegible]	[illegible]	3.1	0.3	[illegible]
Vasum turbinellus	0.3	0.3	5.4	1.9	6.2	2.3	0.2	0.1	1.9	0.6	13.5	4.0	8.6	[illegible]	[illegible]	[illegible]	-	-	[illegible]
Mitra spp.	1.0	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conus ebraeus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conus spp.	6.9	7.5	9.2	3.2	8.4	3.1	1.5	0.8	5.9	2.0	4.7	1.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.2	[illegible]
Terebra spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Siphonariidae	1.0	1.1	1.6	0.6	1.1	0.4	0.3	0.2	0.7	0.2	1.8	0.5	1.4	[illegible]	[illegible]	[illegible]	0.7	1.8	2.1
Cellana	1.8	2.0	3.7	1.3	2.6	1.0	2.4	1.2	12.2	4.2	18.8	5.5	6.8	[illegible]	[illegible]	[illegible]	1.1	2.8	[illegible]
Unidentified	18.8	20.5	40.0	14.0	50.3	18.8	16.7	9.7	20.0	6.8	20.3	6.0	14.3	[illegible]	[illegible]	[illegible]	7.6	19.5	[illegible]
SUBTOTAL	91.8	100.0	286.0	100.0	267.2	100.0	19[illegible]	100.0	292.7	100.0	339.6	100.0	227.[illegible]	[illegible]	76.2	[illegible]	39.0	100.0	[illegible]

LEVEL	1		2		3		4		5		6		7		8		9		
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.
BIVALVIA																			
Anadara antiquata	1.6	5.9	0.3	0.7	1.0	1.4	0.3	0.8	1.7	3.1	-	-	-	-	-	-	-	-	-
Arca ventricosa	0.3	1.1	0.7	1.5	1.4	1.9	0.8	2.2	1.3	2.4	-	-	0.1	[illegible]	[illegible]	[illegible]	0.3	2.7	0.3
Mytilidae	0.8	2.9	2.4	5.3	2.5	3.4	2.2	6.1	2.7	4.9	2.5	5.1	1.9	[illegible]	[illegible]	[illegible]	2.5	22.3	4.6
Isognomon spp.	6.9	25.3	3.5	7.7	8.1	11.0	3.1	8.5	7.8	14.1	1.5	3.1	2.2	6.8	[illegible]	[illegible]	-	-	0.5
Fragum spp.	-	-	-	-	0.1	0.1	0.4	1.1	-	-	-	-	-	-			-	-	-
Tridacna maxima	-	-	-	-	-	-	-	-	-	-	-	-	-		-			-	-
Scutarcopagia scobinata	0.2	0.7	0.4	0.9	0.2	0.3	-	-	-	-	-	-	3.5	10.8			3.3	2.7	-
Tellina spp.	8.8	32.2	18.1	40.0	29.1	39.6	13.0	35.8	25.5	46.4	23.5	48.3	8.7	26.9	[illegible]	[illegible]	1.1	9.8	1.2
Asaphis violascens	0.7	2.6	13.8	30.5	10.3	14.0	5.9	16.3	2.4	4.3	6.3	12.9	3.8	11.7	[illegible]	[illegible]	0.6	5.4	0.6
Gari maculosa	-	-	-	-	-	-	-	-	-	-	-	-	1.4	4.3	[illegible]	[illegible]	-	-	-
Gafrarium tumidum	-	-	0.3	0.7	0.3	0.4	-	-	0.2	0.4	0.3	0.6	-	-			0.2	1.8	0.3
Periglypta spp.	0.2	0.7	1.0	2.2	3.5	4.8	1.4	3.9	3.4	6.2	4.8	9.9	1.0	3.1	[illegible]	[illegible]	0.4	3.6	-
Pitar spp.	-	-	-	-	-	-	-	-	0.2	0.4	0.4	0.8	-				0.5	4.5	0.1
Unidentified	7.8	28.6	4.7	10.4	17.0	23.1	9.2	25.3	9.9	17.9	9.4	19.3	9.8	30.[illegible]	[illegible]	[illegible]	5.3	47.3	7.4
SUBTOTAL	27.3	100.0	45.2	100.0	73.5	100.0	36.3	100.0	55.2	100.0	48.7	100.0	32.4	100.0	[illegible]	[illegible]	11.2	100.0	15.0
TOTAL	119.1		331.2		340.7		228.4		347.9		388.3		259.9		[illegible]		50.2		71.9

nit 4. 1/8 inch screen.

	5		6		7		8		9		10		11		12		13		14		15	
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%
[illegible]	[illegible]	8.5	25.8	7.6	7.4	3.3	4.6	6.0	[illegible]	[illegible]	5.3	9.3	5.8	9.3	9.3	10.5	11.1	9.6	8.5	7.9	6.8	15.0
[illegible]	[illegible]	33.7	106.1	31.2	99.4	43.7	13.3	17.5	[illegible]	[illegible]	5.1	9.0	11.9	19.2	13.8	15.6	16.5	14.2	27.7	25.7	6.1	13.5
[illegible]	[illegible]	5.0	8.9	2.6	7.9	3.5	3.9	5.1	[illegible]	[illegible]	0.4	0.7	0.6	1.0	1.1	1.2	6.4	5.5	0.7	0.6	8.0	17.7
[illegible]	[illegible]	0.6	6.4	1.9	0.5	0.2	1.6	2.1	[illegible]	1.3	1.8	3.2	0.3	0.5	-	-	1.7	1.5	2.3	2.1	0.1	0.2
[illegible]	[illegible]	2.4	8.0	2.4	5.9	2.6	3.7	4.9	[illegible]	1.5	1.1	1.9	2.4	3.9	4.0	4.5	2.8	2.4	1.3	1.2	2.8	6.2
[illegible]	[illegible]	0.9	2.9	0.9	4.5	2.0	4.9	6.4	[illegible]	8.7	4.0	7.0	4.5	7.2	0.9	1.0	1.7	1.5	2.2	2.0	0.8	1.8
	[illegible]	3.4	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	[illegible]	1.0	7.8	2.3	3.8	1.7	0.2	0.3	[illegible]	[illegible]	3.7	6.5	2.4	3.9	0.4	0.5	0.4	0.3	0.4	0.4	0.2	0.4
[illegible]	[illegible]	0.1	3.9	1.1	0.1	0.0	1.3	1.7			0.1	0.2	1.6	2.6	0.3	0.3	0.3	0.3	1.1	1.0	1.0	2.2
		-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-
[illegible]	[illegible]	14.0	55.1	16.2	23.5	10.3	10.2	13.4	[illegible]	[illegible]	4.8	8.4	12.2	19.6	14.8	16.7	22.6	19.5	17.8	16.5	7.4	16.4
[illegible]		-	0.8	0.2	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-
[illegible]		-	0.1	0.0	-	-	-	-	[illegible]	[illegible]	-	-	-	-	0.6	0.7	0.6	0.5	0.4	0.4	0.8	1.8
[illegible]	[illegible]	1.4	-	-	-	-	-	-			-	-	-	-	-	-	0.5	0.4	0.3	0.3	-	-
		-	-	-	0.5	0.2	-	-			-	-	-	-	-	-	-	-	-	-	-	-
		-	1.9	0.6	0.4	0.2	-	-			-	-	-	-	-	-	1.0	0.9	0.8	0.7	-	-
	[illegible]	0.8	2.1	0.6	2.1	0.9	2.3	3.0	[illegible]	[illegible]	2.1	3.7	1.1	1.6	5.5	6.2	6.1	5.3	4.9	4.5	2.8	6.2
	[illegible]	0.5	-	-	7.4	3.3	0.2	0.3			0.4	0.7	-	-	5.1	5.7	0.6	0.5	8.0	7.4	-	-
	[illegible]	0.3	0.4	0.1	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-
	[illegible]	12.1	43.2	12.7	25.5	11.2	5.9	7.7	[illegible]	[illegible]	[illegible]	7.0	4.5	7.2	3.3	3.7	7.0	6.0	6.3	5.8	3.5	7.7
	[illegible]	1.1	3.7	1.1	2.8	1.2	0.9	1.2	[illegible]	[illegible]	0.3	0.5	1.1	1.8	0.4	0.5	1.3	1.1	1.8	1.7	0.3	0.7
	[illegible]	0.2	3.4	1.0	1.2	0.5	0.3	0.4	[illegible]	[illegible]	0.2	0.4	0.5	0.8	1.4	1.6	1.2	1.0	1.5	1.4	-	-
	[illegible]	0.6	13.5	4.0	8.8	3.9	2.7	3.5	-	-	0.1	0.2	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	-	-	-	-
	[illegible]	2.0	4.7	1.4	3.3	1.5	5.5	7.2	[illegible]	7.2	3.3	5.8	0.9	1.4	5.4	6.1	6.1	5.1	2.7	2.5	0.8	[illegible]
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	1.8	-	-
	[illegible]	0.2	1.8	0.5	1.4	0.6	0.9	1.2	[illegible]	1.8	2.1	3.7	1.1	1.8	2.5	2.8	4.3	3.7	1.5	1.4	0.4	0.9
	[illegible]	4.2	18.8	5.5	6.8	3.0	1.6	2.1	[illegible]	2.8	1.0	1.8	0.9	1.4	1.4	1.6	7.3	6.3	3.7	3.4	0.2	0.4
	[illegible]	6.8	20.3	6.0	14.3	6.3	12.2	16.0	7.6	19.5	17.1	33.1	[illegible]	16.6	18.5	20.9	16.2	14.0	12.1	11.2	3.2	7.1
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	[illegible]	100.0	339.6	100.0	227.5	100.0	76.2	100.0	39.0	100.0	56.9	100.0	62.1	100.0	88.7	100.0	115.8	100.0	107.9	100.0	45.2	100.0

	5		6		7		8		9		10		11		12		13		14		15	
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%
[illegible]	[illegible]	3.1	-	-	-	-	-	-		-	-	-	-	-	-	-	0.2	0.6	-	-	-	-
[illegible]	[illegible]	2.4	-	-	0.1	0.3	0.6	3.6	[illegible]	2.7	0.3	2.0	0.2	1.0	0.9	2.7	1.9	5.5	0.5	2.4	0.7	4.8
	[illegible]	4.9	2.5	5.1	1.9	5.9	2.7	16.2	[illegible]	[illegible]	4.6	30.7	[illegible]	23.5	4.5	13.4	6.0	17.4	2.9	14.0	2.0	13.6
	[illegible]	14.1	1.5	3.1	2.2	6.8	0.6	3.6	-	-	0.5	3.3	0.1	0.5	2.1	6.3	0.3	0.9	0.7	3.4	-	-
		-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-		-	-	-	-	-	0.2	0.6	0.2	0.6	-	-	6.8	46.3
		-	-	-	3.5	10.8	-	-	[illegible]	2.7	-	-	0.2	1.0	0.2	0.6	-	-	-	-	-	-
[illegible]	[illegible]	46.4	23.5	48.3	8.7	26.9	2.2	13.2	[illegible]	9.8	1.2	8.0	3.0	15.0	4.3	12.8	[illegible]	37.7	5.1	24.6	1.9	12.9
[illegible]	[illegible]	4.3	6.3	12.9	3.8	11.7	1.1	6.6	[illegible]	5.4	0.6	4.0	0.4	2.0	0.3	0.9	0.9	2.6	0.3	1.4	-	-
		-	-	-	1.4	4.3	0.5	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	[illegible]	0.4	0.3	0.6	-	-	-	-	[illegible]	1.8	0.3	2.0	0.2	1.0	1.0	3.0	0.6	1.7	1.7	8.2	0.8	5.4
[illegible]	[illegible]	6.2	4.8	9.9	1.0	3.1	0.4	2.4	[illegible]	3.6	-	-	0.2	1.0	0.7	2.1	0.8	2.3	1.3	6.3	0.2	1.4
	[illegible]	0.4	0.4	0.8	-	-	-	-	[illegible]	4.5	0.1	0.7	0.5	2.5	2.9	8.7	2.0	5.8	0.8	3.9	-	-
[illegible]	[illegible]	17.9	9.4	19.3	9.8	30.2	8.6	51.5	[illegible]	47.3	7.4	49.3	10.5	52.5	16.4	49.0	8.6	24.9	7.4	35.7	2.3	15.6
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[illegible]	[illegible]	100.0	48.7	100.0	32.4	100.0	16.7	100.0	[illegible]	100.0	15.0	100.0	20.0	100.0	33.5	100.0	34.5	100.0	20.7	100.0	14.7	100.0
	======		======		======		======		======		======		======		======		======		======		======	
	[illegible]		388.3		259.9		92.9		50.2		71.9		82.1		122.2		150.3		128.6		59.9	

Table 16. Marine shell midden, Excavation Unit 5, 1/8 inch screen.

LEVEL	1		2b		2a		3		4		5		F-1 4		6		VI/7		F-3 7
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.
GASTROPODA																			
Trochus spp.	23.6	10.7	9.6	7.6	2.4	1.7	3.0	1.8	20.3	19.1	112.5	29.5	2.0	26.7	[illegible]	[illegible]	7.7	12.3	1.0
Turbo argyrostomus	56.4	16.4	47.8	38.1	96.9	69.8	86.0	51.4	34.8	32.7	133.6	35.1	1.8	24.0	[illegible]	[illegible]	11.6	18.5	2.4
Turbo spp. operculae	12.1	5.5	16.8	13.4	16.8	12.1	33.3	19.9	10.5	9.9	45.6	12.0	-	-	[illegible]	[illegible]	3.8	6.1	-
Nerita plicata	3.6	1.6	0.7	0.6	0.7	0.5	0.8	0.5	0.6	0.6	1.7	0.4	-	-	[illegible]	[illegible]	-	-	-
Nerita polita	-	-	2.9	2.3	-	-	-	-	-	-	-	-	-	-			-	-	-
Nerita puperita	1.0	0.5	1.5	1.2	0.3	0.2	0.8	0.5	1.4	1.3	1.3	0.3	-	-	[illegible]	[illegible]	0.5	0.8	0.2
Cerithrium spp.	7.9	3.6	3.4	2.7	1.6	1.2	2.1	1.3	1.0	0.9	2.4	0.6	0.2	2.7	[illegible]	[illegible]	6.3	10.1	0.5
Rhinoclavis sinensis	3.5	1.6	0.6	0.5	0.2	0.1	0.3	0.2	0.3	0.3	1.2	0.3	-	-	[illegible]	[illegible]	-	-	-
Rhinoclavis spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	0.2	0.3	0.2
Strombus gibbosus	-	-	-	-	-	-	-	-	-	-	3.3	0.9	-	-	[illegible]	[illegible]	-	-	-
Strombus mutabilis	13.5	6.1	3.7	2.9	0.1	0.1	1.4	0.8	0.6	0.6	2.0	0.5	0.6	8.0	[illegible]	[illegible]	0.9	1.4	-
Strombus spp.	-	-	-	-	-	-	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-
Hipponicidae	4.8	2.2	-	-	0.4	0.3	0.1	0.1	0.1	0.1	0.9	0.2	0.2	2.7	[illegible]	[illegible]	1.0	1.6	-
Cypraea annulus	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
Cypraea isabella	1.9	0.9	0.9	0.7	-	-	-	-	-	-	-	-	-	-		-	-	-	-
Cypraea moneta	7.3	3.3	3.7	2.9	-	-	-	-	-	-	2.7	0.7	-	-		-	0.8	1.3	-
Cypraea tigris	10.4	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cypraea vitellus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cypraea spp.	2.3	1.0	1.0	0.8	1.4	1.0	1.4	0.8	0.2	0.2	1.8	0.5	-	-	[illegible]	[illegible]	1.8	2.9	-
Cymatium spp.	-	-	-	-	-	-	-	-	1.9	1.8	0.9	0.2	-	-		-	-	-	-
Bursa spp.	-	-	-	-	-	-	17.5	10.5	8.8	8.3	2.3	0.6	-	-	-		-	-	-
Muricidae drupa	28.5	12.9	20.2	16.1	4.4	3.2	10.7	6.4	11.3	10.6	44.9	11.8	2.0	26.7	[illegible]	[illegible]	10.0	16.0	0.5
Engina spp.	2.0	0.9	1.2	1.0	0.6	0.4	0.4	0.2	1.4	1.3	1.3	0.3	-	-	[illegible]	[illegible]	2.5	4.0	-
Cantharus spp.	5.6	2.5	0.9	0.7	0.3	0.2	0.5	0.3	0.8	0.8	1.0	0.3	-	-	[illegible]	[illegible]	1.9	3.0	0.5
Columbellidae	3.3	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nassariidae	0.4	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conus ebraeus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	2.1	-
Conus spp.	10.2	4.6	1.3	1.0	0.8	0.6	0.7	0.4	0.8	0.8	0.1	0.0	-	-	[illegible]	[illegible]	0.8	1.3	0.1
Terebra spp.	-	-	-	-	-	-	-	-	-	-	5.7	1.5	-	-	-	-	-	-	-
Siphonariidae	2.0	0.9	1.9	1.5	0.9	0.6	1.0	0.6	3.0	2.8	3.1	0.8	-	-	[illegible]	[illegible]	2.7	4.3	0.1
Cellana	8.5	3.8	2.5	2.0	0.6	0.4	0.7	0.4	3.1	2.9	3.0	0.6	0.1	1.3	[illegible]	[illegible]	2.4	3.8	0.2
Unidentified	32.5	14.7	4.9	3.9	10.4	7.5	6.4	3.8	5.5	5.2	9.5	2.5	0.6	8.0	[illegible]	[illegible]	6.4	10.2	0.2
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SUBTOTAL	221.3	100.0	125.5	100.0	136.8	100.0	167.2	100.0	106.4	100.0	380.8	100.0	7.5	100.0	[illegible]	[illegible]	62.6	100.0	5.9

LEVEL	1		2b		2a		3		4		5		F-1 4		6		VI/7		F-3 7
	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.
BIVALVIA																			
Anadara antiquata	0.9	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Arca ventricosa	2.9	3.6	1.0	1.8	0.1	0.5	0.1	0.3	4.6	14.1	1.2	4.5	0.1	1.9	[illegible]	[illegible]	0.3	4.2	0.2
Mytilidae	6.3	7.8	3.6	6.5	2.0	9.1	4.9	13.2	10.0	30.7	5.7	21.2	0.4	7.5	[illegible]	[illegible]	2.4	33.3	0.1
Isognomon spp.	4.1	5.1	16.5	29.7	4.5	20.5	15.2	41.1	2.7	8.3	2.1	7.8	-	-	[illegible]	[illegible]	0.3	4.2	0.2
Spondylidae	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Ostrea spp.	2.7	3.3	-	-	0.4	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Fragum spp.	0.1	0.1	0.1	0.2	0.2	0.9	0.2	0.5	0.1	0.3	0.1	0.4	-	-	-	-	-	-	-
Tridacna maxima	47.0	58.0	0.1	0.2	1.0	4.6	-	-	7.1	21.8	0.2	0.7	-	-	0.1	[illegible]	-	-	-
Scutarcopagia scobinata	0.8	1.0	-	-	0.2	0.9	-	-	-	-	0.5	1.9	1.9	35.8	[illegible]	[illegible]	-	-	-
Tellina spp.	7.5	9.3	21.0	37.8	3.7	16.9	3.0	8.1	0.7	2.1	8.4	31.2	2.0	37.7	[illegible]	[illegible]	0.2	2.8	0.3
Asaphis violascens	2.3	2.8	2.8	5.0	2.2	10.0	3.5	9.5	1.1	3.4	2.6	9.7	-	-	[illegible]	[illegible]	0.9	12.5	1.1
Gafrarium tumidum	-	-	-	-	-	-	0.3	0.8	0.3	0.9	0.3	1.1	-	-	[illegible]	[illegible]	0.2	2.8	0.1
Periglypta spp.	0.2	0.2	1.7	3.1	-	-	-	-	-	-	-	-	-	-	[illegible]	[illegible]	-	-	-
Pitar spp.	0.2	0.2	-	-	-	-	-	-	1.1	3.4	0.4	1.5	-	-	[illegible]	[illegible]	0.1	1.4	0.3
Unidentified	5.9	7.3	8.7	15.7	7.6	34.7	9.8	26.5	4.9	15.0	5.4	20.1	0.9	17.0	[illegible]	[illegible]	2.8	38.9	0.4
	------	-----	------	------	------	------	------	------	--- --	------	------	------	------	------	---		------	------	------
SUBTOTAL	81.0	100.0	55.5	100.0	21.9	100.0	37.0	100.0	32.6	100.0	26.9	100.0	5.3	100.0	[illegible]		7.2	100.0	2.7
	======		======		======		======		======		======		======		======		======		======
TOTAL	302.3		181.0		160.7		204.2		139.0		407.7		12.8		[illegible]		69.8		8.6

ation Unit 5, 1/8 inch screen.

3		4		5		F-1 4		6		VII/[illegible]		F-3 7		VII/7		F-3 8		8		9		[illegible]	
gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%
[illegible].0	1.8	20.3	19.1	112.5	29.5	2.0	26.7	15.3	11.9	7.7	[illegible]	[illegible]	16.9	0.9	2.0	0.4	9.5	[illegible]					
[illegible]	51.4	34.8	32.7	133.6	35.1	1.8	24.0	32.5	25.2	11.6	[illegible]	[illegible]	40.7	25.6	56.4	1.8	[illegible]	[illegible]					
[illegible]	19.9	10.5	9.9	45.6	12.0	-	-	15.1	11.7	3.8	[illegible]		-	-	-	-	-	[illegible]					
[illegible].8	0.5	0.6	0.6	1.7	0.4	-	-	1.4	1.1	-			-	-	-	-	-			[illegible]	[illegible]		
-	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-						
[illegible].8	0.5	1.4	[illegible].3	1.3	0.3	-	-	2.8	2.2	0.5	[illegible]		[illegible]	-	-	-	-			[illegible]	[illegible]		
[illegible]	1.3	1.0	0.9	2.4	0.6	0.2	2.7	3.6	2.8	6.3	[illegible]	[illegible]	[illegible]	1.2	2.6	0.1	[illegible]			[illegible]			
[illegible]	0.2	0.3	0.3	1.2	0.3	-	-	0.4	0.3	-			-	-	-	-	-						
-	-	-	-	-	-	-	-	-	-	0.2	[illegible]		[illegible]	0.2	0.4	-	-	[illegible]					
-	-	-	-	3.3	0.9	-	-	4.4	3.4	-			-	-	-	-	-						
[illegible]	0.8	0.6	0.6	2.0	0.5	0.6	8.0	11.6	9.0	0.9	[illegible]		-	-	-	-	-			[illegible]			
[illegible]	0.1	-	-	-	-	-	-	-	-	-			-	-	-	-	-						
[illegible]	0.1	0.1	0.1	0.9	0.2	0.2	2.7	0.7	0.5	1.0	[illegible]		-	0.1	0.2	-	-						
-	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-						
-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-						
-	-	-	-	2.7	0.7	-	-	-	-	0.8	[illegible]		-	-	-	-	-			[illegible]			
-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-						
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
[illegible]	0.8	[illegible]	0.2	1.8	0.5	-	-	0.6	0.5	1.8	[illegible]		-	0.3	0.7	-	-	[illegible]		[illegible]	[illegible]		
	-	[illegible]	1.8	0.9	0.2	-	-	-	-	-	-		-	-	-	-	-			[illegible]	[illegible]		
[illegible]	10.5	6.8	8.3	2.3	0.6	-	-	-	-	-	-		-	-	-	-	-			-	-		
[illegible]	[illegible]	11.3	10.6	44.9	11.8	2.0	26.7	22.8	17.7	10.0	[illegible]	[illegible]	6.5	12.5	27.5	1.3	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	0.2	1.4	1.3	1.3	0.3	-	-	2.2	1.7	2.5	[illegible]	-	-	-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	0.3	0.8	0.8	1.0	0.3	-	-	1.1	0.9	1.9	[illegible]	[illegible]	6.5	0.4	0.9	0.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-			
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-			
	-	-	-	-	-	-	-	-	-	1.3	2.1	-	-	-	-	-	-			-			
[illegible]	0.4	0.8	0.8	0.1	0.0	-	-	3.4	2.6	0.8	[illegible]	[illegible]	[illegible]	0.3	0.7	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	-	-	-	5.7	1.5	-	-	-	-	-	-		-	-	-	-	-			-			
[illegible]	0.6	3.0	2.8	3.1	0.8	-	-	2.9	2.3	2.7	[illegible]	[illegible]	[illegible]	0.2	0.4	0.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.4	3.1	2.9	3.0	0.8	0.1	1.3	3.5	2.7	2.4	[illegible]	[illegible]	[illegible]	1.7	3.7	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3.6	[illegible]	5.2	9.5	2.5	0.6	8.0	4.5	3.5	6.4	[illegible]	[illegible]	3.4	2.0	4.4	0.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
[illegible]	100.0	106.4	100.0	380.8	100.0	7.5	100.0	128.8	100.0	[illegible]	100.0	[illegible]	100.0	45.4	100.0	4.2	100.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

3		4		5		F-1 4		6		[illegible]		F-3 7		VII/7		F-3 8		[illegible]		[illegible]		[illegible]	
[illegible]	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	gm.	%	[illegible]	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
[illegible]	0.3	4.6	14.1	1.2	4.5	0.1	1.9	0.1	0.5	0.3	4.2	0.2	7.4	0.2	5.4	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	13.2	10.0	30.7	5.7	21.2	0.4	7.5	5.1	26.4	2.4	33.3	0.1	3.7	0.3	8.1	0.2	25.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	41.1	2.7	8.3	2.1	7.8	-	-	0.4	2.1	0.3	4.2	0.2	7.4	0.1	2.7	-	-	0.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[illegible]	[illegible]	0.1	0.3	0.1	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-		0.2	[illegible]	[illegible]	[illegible]
-	-	7.1	21.8	0.2	0.7	-	-	0.1	0.5	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]	[illegible]
-	-	-	-	0.5	1.9	1.9	35.8	4.1	21.2	-	-	-	-	-	-	-	-	-	-	-		[illegible]	[illegible]
[illegible].0	8.1	0.7	2.1	8.4	31.2	2.0	37.7	0.5	2.6	0.2	[illegible]	0.3	11.1	1.4	37.8	0.3	37.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible].5	9.5	1.1	3.4	2.6	9.7	-	-	2.9	15.0	0.9	[illegible]	1.1	40.7	-	-	-	-	[illegible]	[illegible]	1.0	[illegible]	1.0	[illegible]
0.3	0.8	0.3	0.9	0.3	1.1	-	-	0.4	2.1	0.2	[illegible]	0.1	3.7	0.6	16.2	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-	-	-	-	-	-	-	-	0.4	2.1	-		-	-	-	-	0.3	37.5	-	-	0.2	[illegible]	0.1	[illegible]
-	-	1.1	3.4	0.4	1.5	-	-	0.2	1.0	0.1	[illegible]	0.3	11.1	-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible].8	26.5	4.9	15.0	5.4	20.1	0.9	17.0	5.1	26.4	2.8	[illegible]	0.4	14.8	1.1	29.7	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
37.0	100.0	32.6	100.0	26.9	100.0	5.3	100.0	19.3	100.0	[illegible]	[illegible]	2.7	100.0	3.7	100.0	0.8	100.0	7.3	100.0	8.0	100.0	13.8	100.0
======		======		======		======		======		======		======		======		======		======		======		======	
204.2		139.0		407.7		12.8		148.1		69.6		8.6		49.1		5.0		59.4		55.2		[illegible]	

due to time constraints for the preparation of this report. However, this would clearly be a valuable research topic for future investigators dealing with archaeological shell midden in Guam.

Another interpretive problem concerns the definition of "common" with respect to weight percentages. The present analysis is obviously highly biased toward the heavier shell species. For example, a single heavy shell, such as a large Conus, would overwhelm numerous smaller shells in terms of weight, such as Cypraea moneta. But Cypraea moneta may in fact be much more commonly exploited and provide greater overall contribution to the diet. The way to get around this problem would be to convert shell weights to a measurement of food value per unit weight of shell. Unfortunately, such an endeavor is beyond the scope of the present project. The primary data, however, is provided so that such a investigation can be performed at some later time.

The first step of the present analysis concerned the determination of the relative importance of gastropod species compared to bivalve species in the midden remains. The graphs of Figures 20 and 21 provide the results of this analysis. As may be seen, gastropods are generally 2 to about 6 times more common (by weight) than bivalves. There are also several extreme values, and these all occur in Excavation Unit 5. The proveniences concern level 5, Feature 1 in level 4 (a pit feature emanating from Layer III), and Layer VII of level 7. The proportional values are 14.15, 18.8, and 12.26, respectively. All of these proveniences represent occupation layers, though curiously, Layer III (levels 2a and 3) does not show such an extreme preponderance of gastropods. Likewise, Layer III of Excavation Unit 4 does not show any more than the usual preponderance (approximately 3 to 6 times more gastropods than bivalves).

At present there is no logical explanation for the general lack of patterning in the proportions of gastropods to bivalves in the midden. Even the non-cultural and/or non-occupation layers do not show a sharp distinction from the occupation layers as might be expected. This tends to reinforce the earlier statement that a fairly large percentage of the shell midden may actually be naturally deposited shell. The extremely high ratios found in Excavation Unit 5 could possibly be related to the closeness of the archaeological deposits to the beach, though whether cultural selection or natural deposition was the reason for their presence in the occupation layers is unclear.

Concerning the most common species of shellfish represented in the excavation units, analysis of Table 14 for Excavation Unit 1 reveals that there is considerable variation among the two most

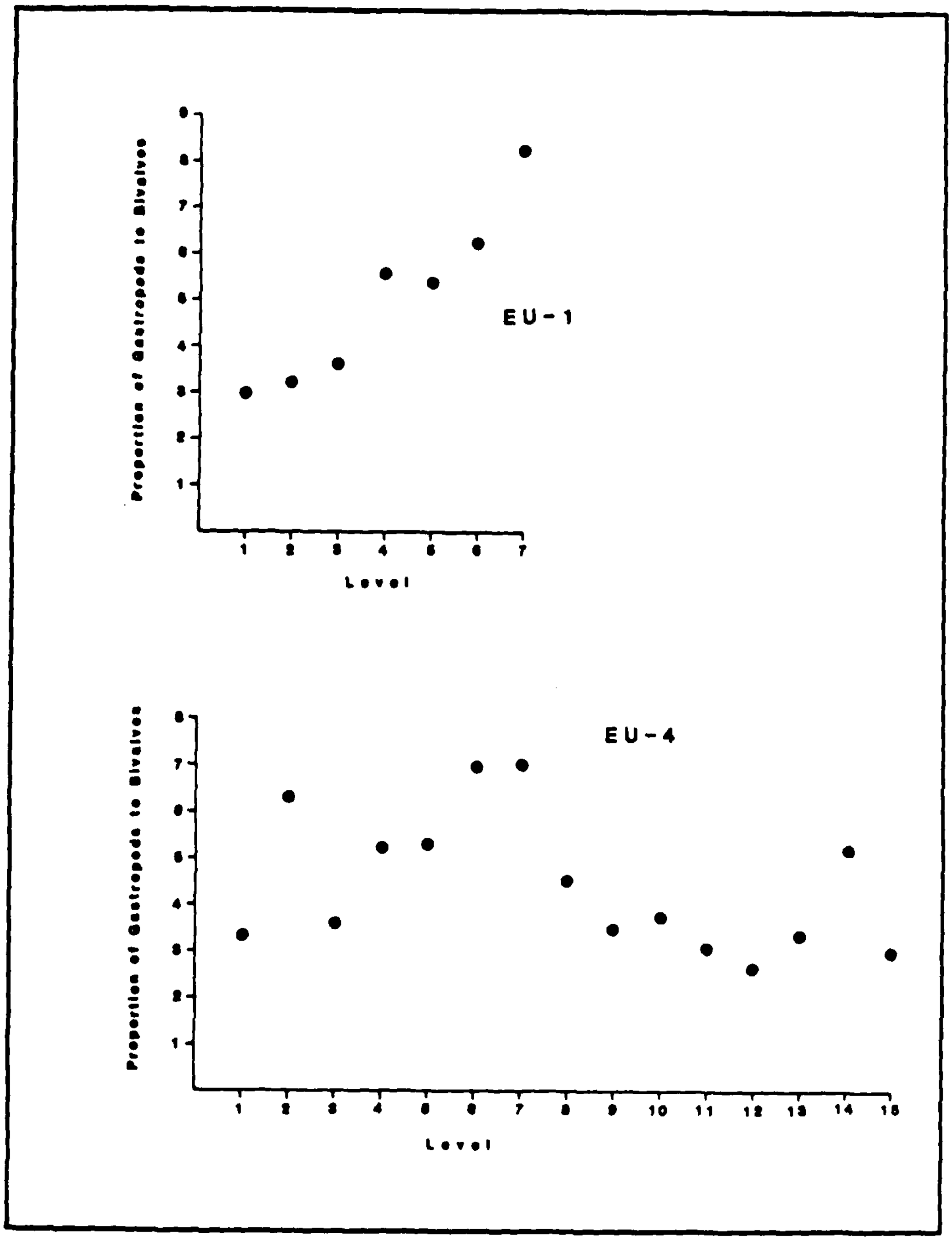

Figure 20. Graphs of the proportion of gastropods to bivalves by level in Excavation Units 1 and 4.

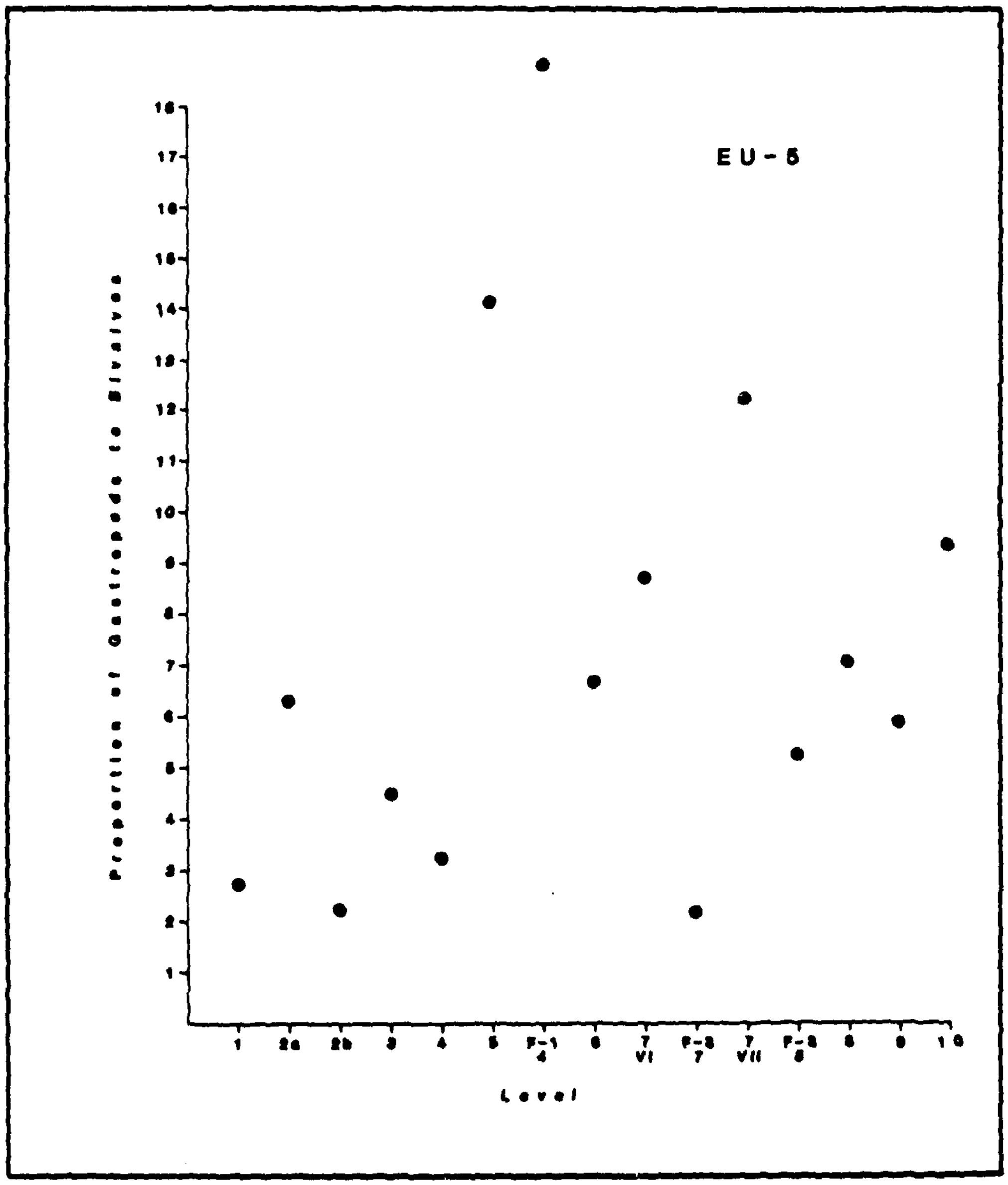

Figure 21. Graph of proportion of gastropods to bivalves by level in Excavation Unit 5.

comon gastropod and bivalve species in the different levels. Turbo argyrostomus, Trochus spp., Muricidae, Strombus mutabilis are most commonly represented among the gastropods, and Tellina spp., Mytilidae, Asaphis violascens, Periglypta spp., and Gafrarium tumidum are most common among the bivalves. There is no discernable patterning in shell types between levels (eg. upper levels vs lower levels). The top two gastropod and bivalve species account for approximately 31% and 44 % of the totals, respectively. A wide range of species are represented in the remainder of the species list in generally very small quantities.

With respect to Excavation Unit 4, Table 15 reveals very little variation in the two most common gastropod and bivalve species. Among the gastropods, Turbo argyrostomus, was generally the most common, followed by either Strombus mutabilis, or Muricidae (drupa). Among bivalves, Tellina spp. was almost always the most common, followed by either Asaphis violascens or Mytilidae. There does not appear to be any clear distinction in shell types or percentages between Layer III (levels 2 and 3), which is the main occupation layer, and the non-occupation other layers. The top two gastropod and bivalve species account for approximately 37% and 47% of the totals, respectively. A wide range of species are represented for the remainder of the shell types in generally very small quantities.

In Excavation Unit 5, Table 16 indicates considerable variation between levels of the two most common gastropod and bivalve species. Among the gastropods are Turbo argyrostomus, Muricidae (drupa), Bursa sp., Trochus sp., Cerithrium sp. and Cypraea vitellus. Among the bivalves are Tridacna maxima, Tellina sp., Isognomon sp., Mytilidae, Scutarcopagia scobinata, Asaphis violascens, Pitar spp., Gafrarium tumidum, and Periglypta spp. There does not appear to be any consistency in the most common midden types for the main occupation layers (III, V, and VII) as opposed to the non-occupation layers. The top two gastropod and bivalve species account for approximately 55% each of the totals. A wide range of species are represented for the remainder to the shell types in generally very small quantities.

In order to assess possible cultural preferences for the selection of gastropods over bivalves in shellfish exploitation strategies, Mr. Charles Streck (personal communication) has suggested the use of a species diversity index. This index is derived by dividing the number of gastropods or bivalve species in a particular level by the total number of gastropods or bivalves found in the entire excavation unit (or all excavation units combined). Differing weights of the shell species, therefore, have no influence in the determination of the degree of selection that may be otherwise masked. A high diversity index indicates many species were being selected, while

a low diversity index indicates that relatively few species were being selected. Thus, a highly selective exploitative strategy would be indicated by a low diversity index, while the opposite would be true for a broad spectrum strategy of shellfish harvesting.

Diversity indices have been calculated for Excavation Units 1, 4, and 5. These are graphically illustrated in Figure 22. Probably the most notable feature of the graphs is that with few and minor exceptions, all the curves within each graph very closely follow one another. Furthermore, most of the indexes for all the curves fall between 0.50 and 0.75. These factors reaffirm the previous conclusion that there was evidently very little selective exploitation of either gastropods or bivalves at Tarague; shellfish were by and large collected and consumed in direct proportion to their natural abundance. The relatively low diversity readings for Feature 3 (levels 7 and 8) and Layer VII (level 7) in Excavation Unit 5 is believed to be due to small sample size. Even in these cases, however, all the curves cluster together very tightly, suggesting very little in the way of selective exploitation.

Fish and Mammal Bone (by Sara Collins)

The bone identifications are listed in Tables 17 and 18. The identification categories utilized are the following:

Medium Vertebrate:	Bone from an animal with a total head and body length from one to three or four feet. In the Tarague material, bone assigned to this category could derive from fish, reptile, or mammal.
Chondrichthyes:	Bone from an animal in the Class of Cartilaginous Fishes; in this case Shark.
Pisces:	Bone from an individual in the Class of Bony Fishes.
Scaridae:	Bone from an individual in this Family.
Acanthuridae, *Naso* spp.:	Bone that definitely comes from a reef fish of this genus.

Shell
Species Diversity Index

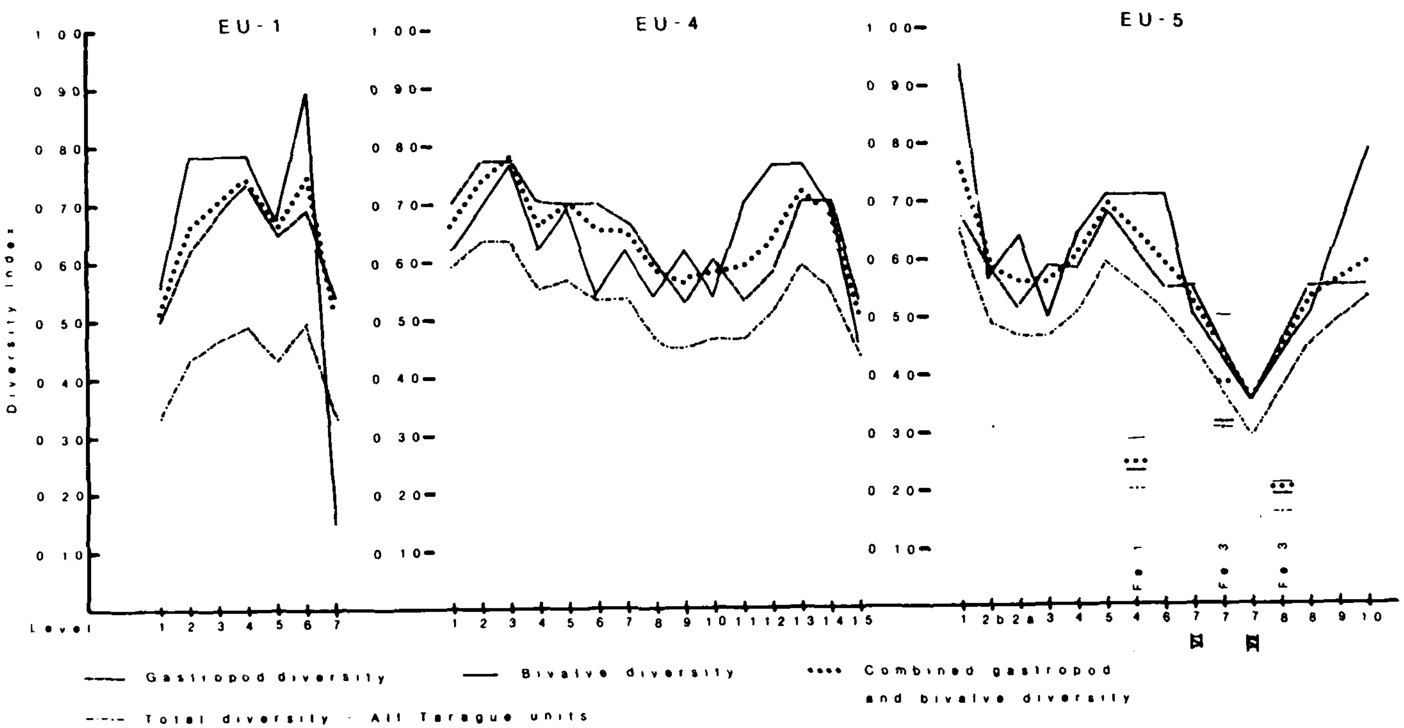

Figure 22. Graphs of shellfish diversity indices for Excavation Units 1, 4, and 5.

Table 17. List of identified bone, Excavation Units 1, 2, 3, and 4.

Excavation Unit & Provenience	Medium Vertebrate	Chondrichthyes	Pisces	Scaridae	cf. *Naso* spp.	?Lizard	Turtle	Large Mammal	*Homo Sapiens*	*Rattus* spp.
EU-1: II/2, 1/8"			0.2							
II/3, 1/4"	2.1									
II/3, 1/8"	1.7		0.3							
II/4, 1/8"	0.5		0.4							
II/5, 1/8"	0.1									
II/5, 1/4"			0.3							
II/7, 1/8"			0.1							
EU-2: I/1, 1/4"	0.1							24.7		
II/2, 1/4"	0.4									
II/3, 1/4"							0.2	0.6		
EU-3: I/1, 1/8"	4.9									
II/2, 1/4"	3.2									
II/3, 1/4"	0.6									
EU-4: I/1, 1/8"	0.8		0.6	1.0						0.2
II/2, 1/8"	11.3		4.1							0.5
III/3, 1/8"	21.6		9.8				5.1		0.6	2.9
III/4, 1/8"	10.8		6.9							0.6
IV/5, 1/8"	4.3		3.4			<0.1	1.3			0.2
V/6, 1/8"	0.6		1.3							
VI/7, 1/8"	2.6		0.4							
VI/8, 1/8"	0.4		1.1							
VI/9, 1/8"			3.3							
VI/10, 1/8"			0.5							
VI/11, 1/8"			0.2							
VI/12, 1/8"			0.1							
VI/13, 1/8"			0.4							
VII/14, 1/8"			0.5							
VII/15, 1/8"			0.1							

weight in grams

Table 18. List of identified bone, Excavation Unit 5.

Provenience	Medium Vertebrate	Chondrichthyes	Pisces	Scaridae	cf. *Naso* spp.	?Lizard	Turtle	Large Mammal	*Homo Sapiens*	*Rattus* spp.
I/1, 1/8"	1.3	0.1	0.4							
II/2a, 1/8"	3.2		4.0	0.6					4.9	
III/2b, 1/8"	0.9		0.8	0.1						4.9
III/3, 1/8"	1.2		1.7		0.2		4.9			0.1
IV/4, 1/8"	0.4		0.3						0.2	<0.1
V/5, 1/8"	4.1		1.6							
IV/4, 1/8"			0.2							
VI/6, 1/8"	0.6		0.2							
VI/7, 1/8"			0.1							
VII/7, 1/8"			<0.1							
VI/8, 1/8"	0.3		0.2							

weight in grams

Reptilia, Cheloniidae:	Bone that definitely comes from an individual in the Sea Turtle Family.
Large Mammal:	Bone that comes from a mammal in the size range of a large pig to human.
Muridae, <u>Rattus</u> spp.:	Bone that definitely comes from the Rat and Mouse Family, and from this genus of rat.
<u>Homo sapiens</u>	Bone that definitely comes from a human.

General Observations

The Tarague midden closely resembles the bone midden from other Micronesian archaeological sites that this investigator has examined. The "Medium Vertebrate" category is frequently used because of the following factors:

1. At least some of the fish bone present comes from large pelagic fishes, the fragmentary bones of which cannot be easily differentiated from mammal or turtle bone.

2. The presence of identifiable turtle bone suggests strongly that at least some of the unidentified "Medium Vertebrate" bone is also turtle. Turtle bone and mammal bone are virtually indistinguishable when in a fragmentary state.

The rodent bone assigned to "Muridae, <u>Rattus</u> spp." undoubtedly comes from a large rat the size of the Roof Rat (<u>Rattus rattus</u>) or Norway Rat (<u>Rattus norvegicus</u>) as these species are found in Hawaii. This investigator, however is not willing to assign the Tarague rat bone to one of these taxa because of a lack of suitable reference specimens of Pacific or Polynesian Rat (<u>Rattus exulans</u>) from Micronesia. It is possible that the Tarague rodent comes from prehistorically introduced rat species, but without reference material this cannot be definitely ascertained.

The large mammal bone may actually come from humans, but definitely identifiable fragments of human bone could not be found among the large mammal remains. However, one adult mandibular molar and another fragmentary tooth were identified as being probably human.

Although the presence of large pelagic fish bones was noted (see above), much of the fish bone seemed to come from smaller individuals in size ranges that would be expected from reef and inshore fishes.

Human Skeletal Analysis (by Michael Pietrusewsky)

All human skeletal remains undertaken during the present analysis were derived from Excavation Unit 1 of the Tarague project conducted by Dr. Athens in February and March of 1985 at Andersen Air Force Base, Guam. The skeletal remains were returned to Dr. Athens after analysis so they could be stored with the other excavated materials and eventually returned to Guam. All analyses were conducted at the Physical Anthropology Laboratory of the University of Hawaii.

EU-1, layer I, level 1, 8-12 cm b.d., 1/8 inch screen: Except for a few fragments of non-human bone and shell, these bone fragments are too small to allow further identification. The majority appear to be fragments of human limb bones, primarily cortex, but some may be non-human.

EU-1, layer I, level 1, 8-12 cm b.d., 1/4 inch screen: The majority of these bone fragments may represent human limb bones. Only a single small fragment was diagnosed as definitely non-human. An unerupted human permanent (1st or 2nd?) molar tooth was identified in these remains. The tooth appears to belong to other dental remains found in the sample from level 2 (1/4 inch screen).

EU-1, layer II, level 2, 12-16 cm b.d., 1/8 inch screen: Except for five small fragments, which are identified as non-human, the majority of these fragments are too small and incomplete to allow further identification.

EU-1, layer II, level 2, 12-16 cm b.d., 1/4 inch screen: The majority of these bones appear to be definitely human and from the postcranial region. Except for one humerus shaft fragment, none can be identified more precisely.

Eleven human teeth were further identified in these remains. Four (two second molars and two first molars) are from the deciduous dentition and are fully erupted. Seven represent permanent teeth which, except for a single first molar, were not fully erupted at the time of this individual's death; they are represented by the crown region only. All teeth (including one from level 1, 1/4 inch screen) are probably from the same individual, which was approximately six years of age at death.

Conclusions: The highly fragmented and incomplete skeletal and dental remains from Tarague may represent a single child who was approximately six years of age at death. Bones of the skull were not found. Most of the fragments appear to be from the limb bones of the postcranial skeleton. Some animal bones and shell were found mingled with these remains. While dental remains probably represent a single individual, the shear quantity of long bone remains would indicate the possibility that more than one individual is present.

Chronology

As the earlier discussions of the excavations and pottery analyses have provided considerable details concerning the dating of the archaeological deposits in Excavation Units 1 through 5, only a brief summary will be provided here.

Radiocarbon dates were processed for Excavation Units 4 and 5; one for the former and three for the latter. These are listed in Table 19. In addition, a single modern non-archaeological shell sample was radiocarbon dated in order to derive a reliable ocean reservoir correction factor for archaeological shellsamples. The results of this analysis, previously discussed in Chapter 1, is also presented in Table 19.

The radiocarbon date from Excavation Unit 4 is from the base of the Layer III occupation layer. It has an age of A.D. 1420-1650. The top occupation layer of Excavation Unit 5, also designated Layer III, has a very similar date, which is A.D. 1400-1515. Its more restricted time range suggests that the deposits from which it was derived may be slightly older than those of Excavation Unit 4. A date of A.D. 1260-1405 was derived from the Layer V occupation deposits of Excavation Unit 5. This layer was separated from Layer III by white sand deposits, and the date confirms the expected separation in time. No charcoal was available for dating the deepest occupation layer in Excavation Unit 5--that of Layer VII. However, charcoal derived from Layer VIII was dated to A.D. 625-895, which suggests that Layer VII must date between approximately A.D. 900 and 1100. The Layer VIII deposits did not contain any identifiable cultural material, though the charcoal might be considered as such. It may be derived from human induced fires, such as for clearing, or natural fires, which seems less probable.

Though the radiocarbon dates are indicative of only latte period deposits, which is amply confirmed by the pottery analysis for the dated layers, pre-latte deposits were clearly present in Excavation Units 1, 2, and 3, and also the middle layers of Excavation Unit 4. This was indicated by the pottery

Table 19. Radiocarbon dating analyses, Excavation Units 4 and 5, Tarague Beach.

Cat. #	Lab. #	Excavation Unit	Provenience	Grams	Radiocarbon Years B.P.	C13/C12	C-13 adjusted C-14 age B.P.	Calibrated* Calendar Years
40	Beta-13313	4	Layer III, Level 4, 31-38 cm b.d., dispersed charcoal (coconut shell)	18.8	340 ± 60	-25.06	340 ± 60	A.D. 1420-1650
59	Beta-13314	5	Layer III, Level 3, 27-35 cm b.d., dispersed charcoal (coconut shell)	23.7	430 ± 50	-24.86	430 ± 50	A.D. 1400-1515
61	Beta-13315	5	Layer V, Level 5, 49-63 cm b.d., dispersed charcoal (coconut shell)	22.9	610 ± 60	-24.06	630 ± 60	A.D. 1260-1405
70	Beta-13316	5	Layer VIII, Level 9, 156-162 cm b.d., wood charcoal, some concentrated and a few large chunks	41.2	1240 ± 70	-25.89	1230 ± 70	A.D. 625-895
BPBM 231093**	Beta-14023		Modern shell, _Strombus gibberulus gibbosus_, for estimating ocean reservoir correction factor	30.9	130 ± 50	+ 3.14	590 ± 50	***

* Klein et al. 1982; dates calibrated at 95% confidence interval.

** Catalog number of Bishop Museum. Sample collected by Eugene S. Kuhns at Sumay, Guam in 1930.

*** Correction factor is 570 ± 50 years (1950 - 1930 = 20; 590 - 20 = 570).

found in these units and layers, which appeared to be most closely related to Layer II and III vessel types in the South Profile (the earlier carrinated forms were not present). Since Layer V of the South Profile has a date of 785 B.C.-A.D. 425 (corrected) the age of the deposits in Excavation Units 1, 2, and 3, and middle Excavation Unit 4 may be roughly estimated to be between 0 and 500 A.D. These deposits are not indicative of an occupation layer; rather it is more likely that the cultural material infiltrated from an upper occupation layer which was later removed by storm wave activity. There is no indication that earlier pre-latte deposits may be present in the vicinity of Excavation Units 1 through 4. No pre-latte deposits of any age appear to be present in Excavation Unit 5, though the radiocarbon date from Layer VIII suggests the possibility of very late pre-latte transitional latte deposits may be present in this area.

CHAPTER V

SUMMARY AND CONCLUSION

Because the present project involved excavations at Tarague Beach, where Kurashina and Clayshulte (1983a; 1983b) and Moore (1983) had reported the earliest archaeological deposits in the Mariana Islands at the time of their investigations, an extensive review of early sites and pottery analyses was undertaken to provide a research framework for the new investigations. This review made it clear that the data used for inferences concerning an occupation at Tarague by 1500 B.C. are probably incorrect due to several problems with radiocarbon dating and depositional context. It now appears that the earliest archaeological materials at Tarague date to the first millennium B.C. (at this time it is not possible to offer a more precise date). Recent field investigations by Joyce Bath (personal communication) appear to firmly document settlement in Guam by the second and third millennia B.C. The earliest evidence for occupation in the Mariana Islands outside of Guam comes from the Laulau site in Saipan, where two dates of nearly 1,000 B.C. are said to derive from the lowest stratigraphic unit. There are a number of sites in Guam and one from Rota dating in the 500 - 300 B.C. range, making settlement in Guam and the other Mariana Islands indisputable by this time. After A.D. 800 Latte period sites become quite common, indicating considerable population growth, which apparently continued until the arrival of the Spaniards in 1521.

Early dates from the South Profile excavated by Kurashina and Moore at Tarague Beach are problematical in several respects. One of these concerns the use of shell as a dating medium. In order to obtain an accurate date, an ocean reservoir correction factor must be applied to the date, which Kurashina neglected to do. His C-13/C-12 corrected shell date for Layer VIII, therefore, overestimated the true calendar age of the sample by approximately 570 years as determined from the correction factor obtained on a modern shell sample.

Another problem with the early South Profile dates concerns whether the dating samples in the earliest two stratigraphic units were associated with the cultural material found in these units since the deposits are clearly secondary. Furthermore, there is the possibility that the cultural material from upper layers or now missing occupation layers may have infiltrated into the lower stratigraphic units through natural processes. The extremely small sample of pottery and its very low density in the lowest stratigraphic unit makes this problem a real possibility that must be considered.

Despite questions as to the validity of the earliest dates from Tarague, there is no question that there are early deposits and that the site is extremely important for understanding the prehistory of Guam. The pottery studies of Moore (1983) provide

an excellent example of how materials from this site can be used to advance knowledge of Guam's prehistory.

Using such attributes of pottery as temper, thickness, surface decoration, rim form, and vessel shape Moore (1983) provides the first detailed and systematic description of Mariana pottery dating from both the latte period and the pre-latte period. Her findings establish a basis for seriation studies, the validity of which could be tested at other sites. The main drawbacks of her work, however, are the limited sample size of pottery from the pre-latte period and the lack of multiple radiocarbon dates for latte period deposits (especially the Grid Squares). The failure to completely excavate the Grid Squares (the deepest of these units only went down 1.30 meters--most were much less--in slightly more than 3 meters of archaeological deposits), was certainly a major factor contributing to the limitations of Moore's study.

Fieldwork for the present project included the excavation of a total of 5 units on the eastern side of Tarague Beach. Excavaton Units 1, 2, and 3 were placed along a dirt road just below the firing range in order to remove a burial that had been encountered during road grading operations. After removing the the burial, excavations proceeded to bedrock limestone approximately 70 cm below the surface. Pottery sherds, while not dense, were found throughout the white sand deposits and into a basal grey sand layer. Charcoal was insufficient for dating, though examination of the pottery indicated a probable middle or late pre-latte age for the material (estimated at approximately 0 to 500 A.D.).

Excavation Unit 4 was placed just outside the graded area in order to assess the amount and significance of archaeological deposits that road grading work had removed. A dense occupation layer was found just below the surface, which was not present in the excavation units in the graded area (Excavation Units 1-3). This occupation layer produced a radiocarbon date of A.D. 1420-1650, and the pottery clearly pertains to the latte period. Pre-latte pottery, although sparse, was found in sand deposits similar to the roadside excavation units, but well below the occupation layer. It appeared probable that there had once been an extensive pre-latte occupation layer, but storm waves had washed away the deposit, leaving only pottery that had infiltrated to lower and undisturbed depths. The pre-latte pottery was limited to the upper part of the thick sand layer; if its presence had been due to redeposition the oottery should have been found throughout the layer. A grey sand layer, probably non-cultural, was found at a much greater depth. Bedrock was not encountered despite reaching a maximum depth of 2.2 meters in the excavation.

The purpose of Excavation Unit 5 was to recover a sample of archaeological material from the same cultural layers that were revealed in the adjacent burn pit profile. This excavation unit was located at the extreme eastern end of Tarague Beach. Three distinct occupation layers were revealed, all separated by white sand deposits. The uppermost layer produced a date of A.D. 1400-1515, while the middle layer had a date of A.D. 1260-1405. The lowest occupation layer, which was present only in one corner of the excavation unit, did not produce enough charcoal for a radiocarbon date. However, a grey sand layer near the base of the excavation unit produced a date of A.D. 625-895, suggesting that the lower occupation layer must date between A.D. 900 and 1100. The lower grey layer produced no evidence of cultural remains other than abundant charcoal. The possibility that the charcoal is natural, however, cannot be dismissed.

While the pottery remains in Excavation Unit 5 were not as abundant as those in Excavation Unit 4, what was there quite obviously pertained to the latte period. There was no evidence for pre-latte pottery anywhere in the excavation unit.

With respect to the burn pit, a 16 meter length of the south face was profiled. Archaeological deposits did not appear to extend to the north face (approximately 5 to 7 meters from the south face). Two very clearly defined post hole features were observed in the layer V and layer VII deposits (one each), and there were at least two other pit features in layer V. There were also two probable pit features emanating from the upper occupation layer and intruding into the middle occupation layer. The exact nature of these possible pits could not be determined from the profile. While the occupation layers appear to terminate on the western side of the burn pit, they continue past the profile boundary on the eastern side. The lower occupation layer (VII) is discontinuous, with the deposits being absent in the middle of the profile. The lower grey sand layer shows up as a very homogeneous sand deposit with smooth boundaries across most of the profile. No charcoal was observed in the profile. Archaeological materials were observed on the surface over a broad area around the burn pit.

One of the primary objectives of the pottery analysis was to test Moore's (1983) seriation of pottery attributes. In this respect, however, the results were only partially successful. One of biggest impediments to the present study was the generally limited pottery sample retrieved from Excavation Unit 5. This was also true of Excavation Units 1, 2, and 3. Another problem, apparently not recognized by previous investigators, concerns the difficulty of defining temper type in a significant number of sherds. The present study indicated that there is a high degree of variability in type and density of temper and it is not always easy to categorize sherds. It was suggested that a thorough

investigation of this variability is needed, and that such an investigation should be conducted with a large sample of sherds that have been thin-sectioned. Another difficulty concerns thickness data curves in which all sherds from a particular provenience are represented without regard to temper type. This method of analysis undoubtedly masks a significant amount of variability which would be of potentially great interest in seriation investigations. Thus, it would probably be much better to construct and analyze curves in terms of single temper types.

Despite the various problems in the pottery analyses, of which temper and thickness data figured most prominently, there was a considerable degree of conformity with Moore's Grid Squares seriation data in Excavation Unit 4 (Layer III). At the very least, this suggests the validity and potential utility of such an investigation. What is needed, however, is a much larger sample of sherds from well dated sites. Since there were no radiocarbon dates from the Grid Squares, this evaluation must be considered preliminary. Nevertheless, additional studies are definitely warranted, and perhaps radiocarbon dates will eventually be forthcoming from the Grid Squares.

Pottery analyses also concerned the other attributes (surface decoration, rim form, and vessel shape). But while these attributes are highly useful for distinguishing gross time periods (latte vs. pre-latte), they do not appear to be capable of generating the fine temporal distinctions that is potentially the case with temper and thickness data. Such analyses, however, did demonstrate the definite presence of pre-latte sherds in Excavation Units 1, 2, and 3, and the middle layer of Excavation Unit 4. They also suggested a time frame of middle to late pre-latte (0 to 500 A.D.).

The analysis of shell midden remains has generally not been very thorough for sites in the Mariana Islands. The present study, attempting to do more than just list the species present, undertook an evaluation of the relative importance of different species and the pattern of resource exploitation by the prehistoric inhabitants of Tarague Beach during the time periods represented in the excavation units. Such an analysis, however, was hindered by evidence that a fairly high percentage of shell remains was the result of natural deposition. This, of course, is an interesting research problem in itself, and the density curves of excavated material were highly useful in suggesting this possibility. Analyses of the shell remains were carried out using both weight percentages and a diversity index. A problem with the weight percentage method is that as a measure of dietary importance, it unduly biases the analysis toward the heavier shells. The diversity index, on the other hand, overcomes this problem by providing a measurement based solely the numbers of species present.

The weight percentage analysis indicated that gastropods predominated over bivalves by a factor of approximately 3 to 6 times, though several layers in Excavation Unit 5 indicated much higher figures. Concerning the most commonly exploited species, only Excavation Unit 4 seemed to indicate any consistency in type of species represented in the different levels. Here *Turbo argyrostomus* was the most common gastropod, followed by either *Strombus mutabilis* or Muricidae (drupa). With respect to bivalves, *Tellina* spp. was usually the most common, followed by either *Asaphis violascens* or Mytilidae. The top two gastropod and bivalve species generally accounted for between 30% and 55% of the total midden, with the remainder distributed among a large number of other species.

A shell species diversity index was computed for all layers of all excavation units (with the exception of Excavation Units 2 and 3, which were not analyzed for shell). The results were then graphed in an effort to determine whether any particular species of gastropod or bivalve was being selectively exploited. Such a method, while overcoming the disadvantage of using shell weights, does not distinguish between shells specie that provide a high return of meat per unit weight versus those that do not. The results of the analysis indicated that there was no selectivity represented in any of the excavation units. Rather, a broad spectrum strategy of shellfish exploitation apparently prevailed.

Analyses of artifacts, fishbone, and mammal bone provided little information of interest due to the paucity of material. The analysis of the highly disturbed skeletal remains found in Excavation Unit 1 also proved to be of limited value, though it was interesting that the burial was that of a child and, furthermore, cranial remains were absent.

In conclusion, it is hoped that the results of this study will be of use to others in the quest for knowledge concerning Guam's prehistory. One of the goals of this report was to provide a critical review of some of the problems facing archaeologists working in Guam. The intention was to highlight areas where more research is needed, as well as to provide a framework for the present study. Unless archaeologists constantly attempt to evaluate their own work and the work of others, the discipline will become a sterile excercise in the presentation of conventional wisdom.

Obviously each project has budgetary and time constraints, and the present project was no exception. These will always be a part of archaeological field investigations, and there is no use bemoaning the fact. However, if a conscious effort is made to recognize and deal with shortcomings in the data, many of the difficulties in dealing with a limited data base can be minimized. In short, research can and must be made more efficient by addressing clearly defined research problems.

Probably the biggest single area needing attention in the practice of archaeology, not just in Guam but everywhere, has to do with sampling. Sampling is basically a strategy for collecting enough data in a systematic manner so that the investigator ends up with data of sufficient quality that he or she can answer or evaluate whatever research questions that have been posed. This determines how many test pits are dug, where they are placed, how many sites are excavated, the measurement of sample volumes, the number of radiocarbon dates processed, the amount of midden used for analysis, the number of sherds needed for temper analysis, how many sherds are analyzed for a determination of temper variability, and virtually any other activity that the investigator may wish to undertake.

There are other problems, of course. If this report has any merit, it is hoped that it will be in pointing out in a convincing fashion that there are substantive methodological problems that must be confronted if significant advances are to be made in understanding Guam's prehistory. There is much more to archaeology than in naively collecting artifacts and obtaining radiocarabon dates without regard to these various problems. Archaeologists must constantly strive to improve their methods, ask new questions of the data, and above all, develope a theoretical sophistication so that truly meaningful research problems can be addressed.

CHAPTER VI

RECOMMENDATIONS

The present investigations have provided a review of land use and previous archaeological investigations at Tarague, as well as a substantial body of information based on new fieldwork. Although the amount of information concerning the archaeological remains at Tarague is considerable, there are still many locations about which very little is known. The total land area is quite large--approximately 5 kilometers (3.1 miles) of shoreline and a width below the limestone escarpment of 400 to 600 meters (1,300 to 2,000 ft.). Although earlier investigators have shown that archaeological remains occur throughout the shoreward areas, relatively little is known about the precise location and character of much of the archaeological materials. As one example, it was previously noted that there are possibly 3 latte sets in varying degrecs of completeness still present on Tarague Beach. Yet the exact location and condition of only one of these sets is known (i.e., the one reported by Kurashina et al. 1981; Moore 1983). Virtually nothing is known about possible archaeological remains in the interior areas of Tarague.

There are two factors that, when taken together, make the management of archaeological resources at Tarague an extremely urgent matter. The first of these is that early archaeological remains have been documented at Tarague (though the precise date of these remains may be questioned, the fact that they pertain to an early period of settlement on Guam is not in doubt). The second factor is that large areas of the shoreward zone have been extensively bulldozed for golf course land fill, leaving only small "islands" and other remnants of undisturbed archaeological deposits in much of this zone. This is precisely the area where the earliest deposits have been found. Because of the rarity of these deposits on Guam, it is absolutely critical that considerable care be taken by the Air Force to insure that no disturbances involving land alteration or land movement be permitted in the shoreward areas without first obtaining clearance from a properly qualified archaeologist. Such clearance should normally involve subsurface test excavations. Other recommendations include the following:

1. Preparation of a "cultural resources management plan" for the Tarague area. This plan should provide precise information on the locations of previously documented archaeological remains, areas of bulldozing, and ideally, some degree of archaeological reconnaissance and test excavations in previously unexplored areas. Areas of present land use by the Air Force (including recreational areas) should be carefully evaluated for surface and subsurface archaeological remains.

2. The burn pit at the eastern end of Tarague should be filled in to control erosion of presently exposed archaeological deposits. No new burn pit should be excavated anywhere within this area without prior archaeological clearance. It appears

possible that a new burn pit could be located on the seaward side of the present pit as archaeological deposits appear to be absent on this side. However, archaeological clearance should be obtained before any excavation is attempted. Based on present evidence, the landward side of the present burn pit probably contains significant archaeological remains below the surface over a broad area.

3. Road work or grading of the dirt road on the eastern side of Tarague (below the firing range) should be carefully confined to previously graded areas with no deepening of the road bed. The present project has demonstrated that subsurface archaeological remains (pre-latte in age) are present within the roadbed area and dense latte period deposits are present just outside the graded area. The extent of these deposits is not presently known.

4. Any new road construction, widening, or alteration of existing routes at Tarague should first have clearance by a qualified archaeologist prior to initiation of work.

5. Once further investigations have been completed on defining the extent and type of archaeological remains within the Tarague area, a new nomination form for the National Register of Historic Places should be prepared and submitted. The Tarague archaeological site--or more properly "archaeological district"--clearly meets National Register criteria in terms of its research significance. The extensiveness of archaeological remains and deposits, great time depth of the deposits, and integrity of the deposits all serve to enhance the district's scientific merit for understanding Guam's history and prehistory. Possible research problems include not only specific details concerning Guam's prehistory (chronology, settlement pattern, early historic contacts, etc.), but also such broader issues as the nature of Marianas settlement, pottery and artifact typologies, social change, and the evolution of complex societies.

PHOTOGRAPHS

Photo 1. Overview of Tarague, eastern side with firing range in bare area. To east.

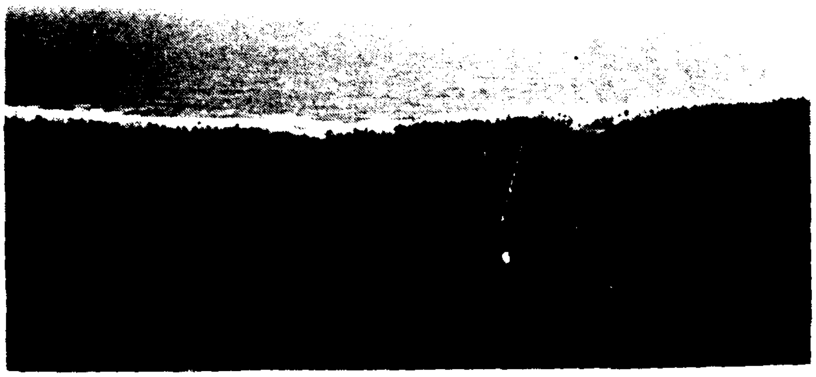

Photo 2. Overview of Tarague, central area with reef channel. To north.

Photo 3. Overview of Tarague, northwestern side. To northwest.

Photo 4. Burial location (see trowel, lower center of photograph) at Excavation Unit 1 prior to excavation. To west.

Photo 5. View to east from Excavation Unit 1.

Photo 6. Burial in Excavation Unit 1 after removal of plastic cover. To north.

Photo 7. Excavation Unit 1, base of level 1. Bone fragments from burial visible in center. To north.

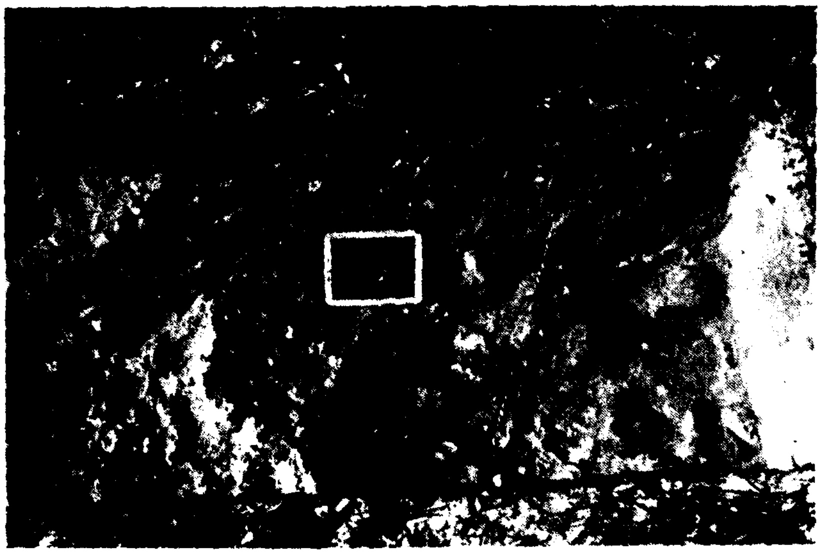

Photo 8. Excavation Units 1 and 3, north face profile and limestone bedrock at base. To north.

Photo 9. Excavation Units 1 and 2, north face profile and limestone bedrock at base. To north.

Photo 10. Excavation Units 1, 2, and 3, after excavation. Note coral cobbles at base of profile. To east.

Photo 11. View of Excavation Unit 4. To east.

Photo 12. Excavation Unit 4, east face profile showing dark cultural layer (Layer III) in center. To east

Photo 13. View of Excavation Unit 5 next to burn pit. To east.

Photo 14. Excavation Unit 5, east face profile.

Photo 15. Excavation Unit 5, north face profile.

Photo 16. View of burn pit. To east.

Photo 17. Work on profiling south face of burn pit. To southeast.

Photo 18. South face profile of burn pit after cleaning. To southwest.

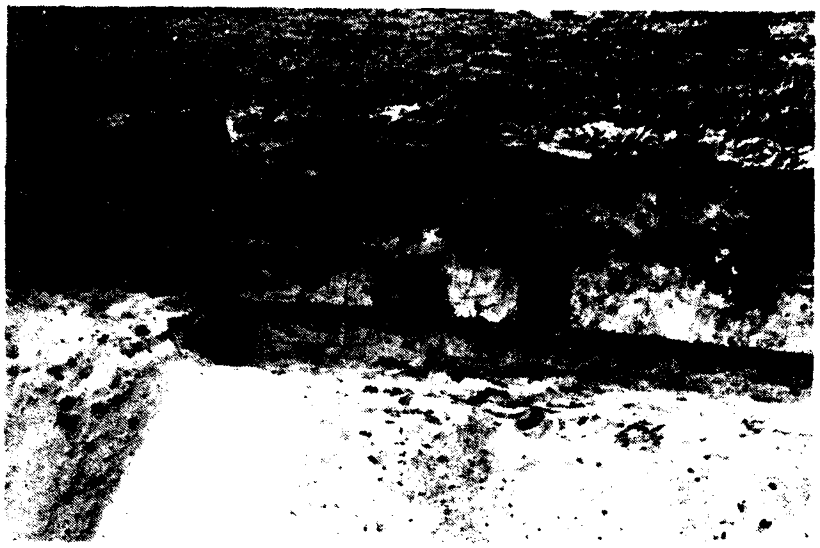

Photo 19. East side of burn pit profile, south face, showing post holes and pit features. To south.

Photo 20. Close-up of center of burn pit profile, south face. To south.

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